the OIL AND GAS JOURNAL

APRIL 9, 1956

With too much sour crude on hand . . .

Texas Producers Go to Washington

Page 70

Should One Field Have Two MER's?

Page 76

Electronic Control for Unifiner

Page 110

Climbing production, limited markets mean

SOMEONE WILL HAVE TO MAKE ROOM FOR CANADIAN CRUDE

Page 64

Refrigeration Stops Trouble on Gas-Lift System. p. 104

24 hours a day, 7 days a week— TIMKEN® bearings take heavy shock loads on this fluid injection pump

USED for oil recovery, this Ajax Triplex pressure pump runs unattended 'round the clock, seven days a week. That calls for dependable performance. And that's why Ajax mounts the crankshaft on Timken® tapered roller bearings.

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Timken bearings are designed to roll true, and they're precision manufactured to conform to their design. You can be doubly sure of Timken bearing quality because we make them from fine alloy steel, produced in our own steel mill. No other American bearing manufacturer takes this *extra* quality control step.

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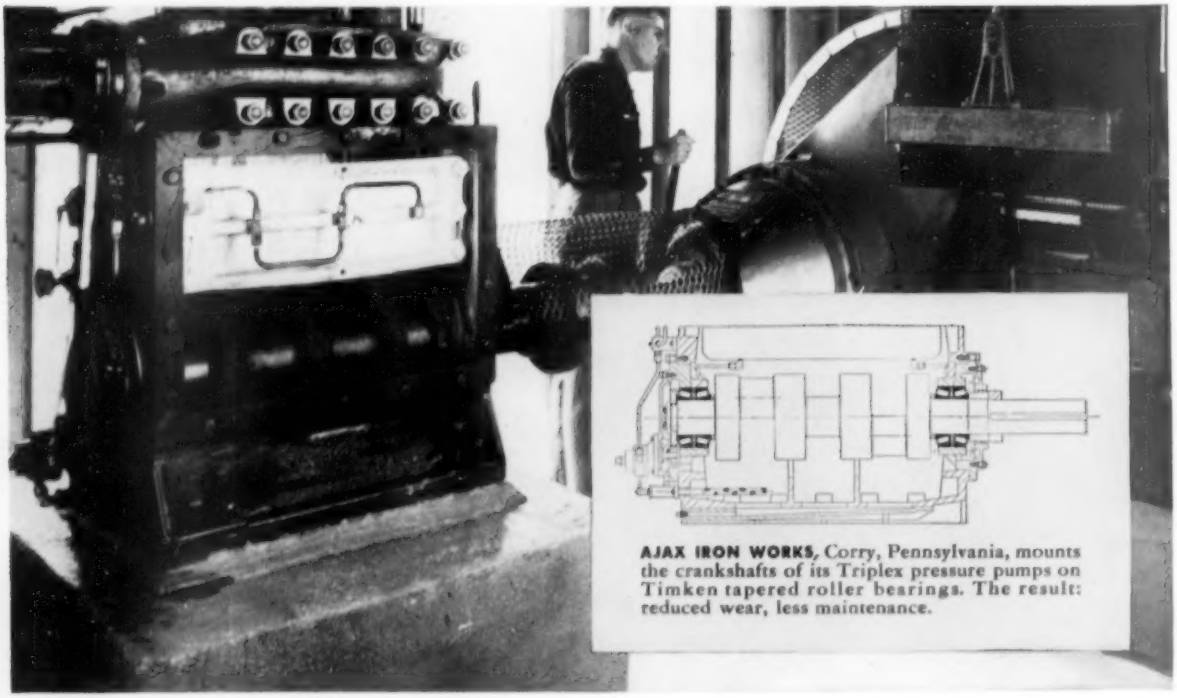

AJAX IRON WORKS, Corry, Pennsylvania, mounts the crankshafts of its Triplex pressure pumps on Timken tapered roller bearings. The result: reduced wear, less maintenance.

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The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

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A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Some crystal-ball gazers looking ahead on engine design see refiners exchanging the octane headache for another on volatility.

They think that packing more engine under lower hoods is going to present new problems in vapor lock, fuel injection notwithstanding. This view is counter to others which hold that fuel injection will permit a broadening of the gasoline boiling range.

Guessing which way to jump on new processes dealing with octane and volatility will become an interesting occupation in the next several years.

Look for wider use of pipelines in moving natural gasoline to refineries. It's being done today in a number of cases and should be done in more. Natural can either be slugged between crude tenders, or blended with crude on a continuous basis.

Watch for the possibility of a new butadiene plant in western Canada Polymer Corp., Canada's government-owned synthetic rubber producer, was forced to make heavy purchases of that important petrochemical basic last year. The company is now supplied with base stocks from refineries in the Sarnia area. To meet higher demand, the company is looking further for raw stocks and may find the solution in a butadiene plant in Alberta, where butane supplies are plentiful.

Development work on the free-piston engine has been virtually halted. Reasons are two-fold: Within recent years performance of conventional engines has been greatly improved by modifications like supercharging, intake air cooling, and higher speeds. Too, some tough engineering problems lie ahead before the free-piston engine will be commercial. Net result is that development of the engine just isn't economically practical at present.

Good-sized pieces of the outer Continental Shelf may be barred to oil and gas development.

The Defense Department is seeking reservation under the Outer Continental Shelf Act of a number of areas for missile range and other purposes. Ten to 15 per cent of the 132,000 sq. miles of shelf in the Gulf of Mexico would be withdrawn from development if all reservations are approved.

The current growth in alkylation is not going to be restricted to butylene feed stocks. With polymerization likely to lose ground as octanes rise, many refiners are considering the alkylation of propylenes. Look for new data on this operation indicating that costs are not prohibitive.

The Supreme Court's anticipated decision on Louisiana's offshore boundary may bring up the Texas tidelands issue again.

Depending on the wording of the Louisiana decision, it may directly affect all other states which claim jurisdiction more than 3 miles from shore. Many offshore operators believe a ruling against Louisiana almost surely would result in a new look at such claims by other states. In such an event, Congress appears to be in no mood to pass new tidelands legislation clarifying the issue.

the OIL AND GAS JOURNAL

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TECHNOLOGY–OPERATION

Refining—Processing

How Ethyl Keeps Rein on Upkeep Costs **86**

By Larry Resen

An extensive maintenance program has developed during the 4 years of operation of Ethyl Corp.'s Houston plant. Results include fast and efficient maintenance techniques for all types of jobs.

Continuous Sampling—2: Don't Sell Sampling Short **93**

By F. H. Warren

Here is a comprehensive discussion of a good many of the automatic sampling devices now on the market.

Electronic Control for New Unifiner **110**

By D. P. Thornton, Jr.

The first electronically controlled Unifining unit has been operating successfully for several months at Rock Island's Indianapolis refinery.

The Refiner's Notebook **123**

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Questions on Technology **131**

Pipelining

Continuous Sampling—2: Don't Sell Sampling Short **93**

By F. H. Warren

Here is a comprehensive discussion of a good many of the automatic sampling devices now on the market.

Pipeline Installs More Compressors, Reduces Noise Level **98**

By Raymond C. Baird

Latest techniques in noise control were used to reduce the noise level at Playa Del Rey compressor station of Southern California Gas Co. near Los Angeles. This was done at the same time that compressor horsepower was increased.

Pipeline Patrol: Moistureproof Splices for Anode Cables **135**

By A. C. Kilberg

Moistureproof splices of uniform quality—a long-standing need in cathodic-protection systems for pipelines—is now a reality.

Pipeline Patrol: Air-Testing American Louisiana 30-In. Line **137**

Ten diesel engines driving compressors will be used to test the long line from Cameron, La., to Willow Run, Mich.

Drilling—Production

Revised A.A.O.D.C. Drilling Report **90**

This new report form now bears the approval of both A.P.I. and A.A.O.D.C. It is a revised version of the form that has been used for nearly 2 years.

How Dust Filters Function **92**

By Dr. John M. Campbell

The filter is composed of densely packed woven elements that trap particles on the face of the pad.

Refrigeration Stops Trouble on Gas-Lift System **104**

By Ed McGhee

The refrigeration system used by Southern Minerals Corp. in Falls City field of Karnes County, Texas, has stopped trouble caused by formation of hydrates and upped the recovery of hydrocarbons.

Permanent-Type Dual Completions Find Favor **117**

By G. H. Tausch and John W. Kenneday

Retrievable production tubes with parallel tubing are now being used for dual completions.

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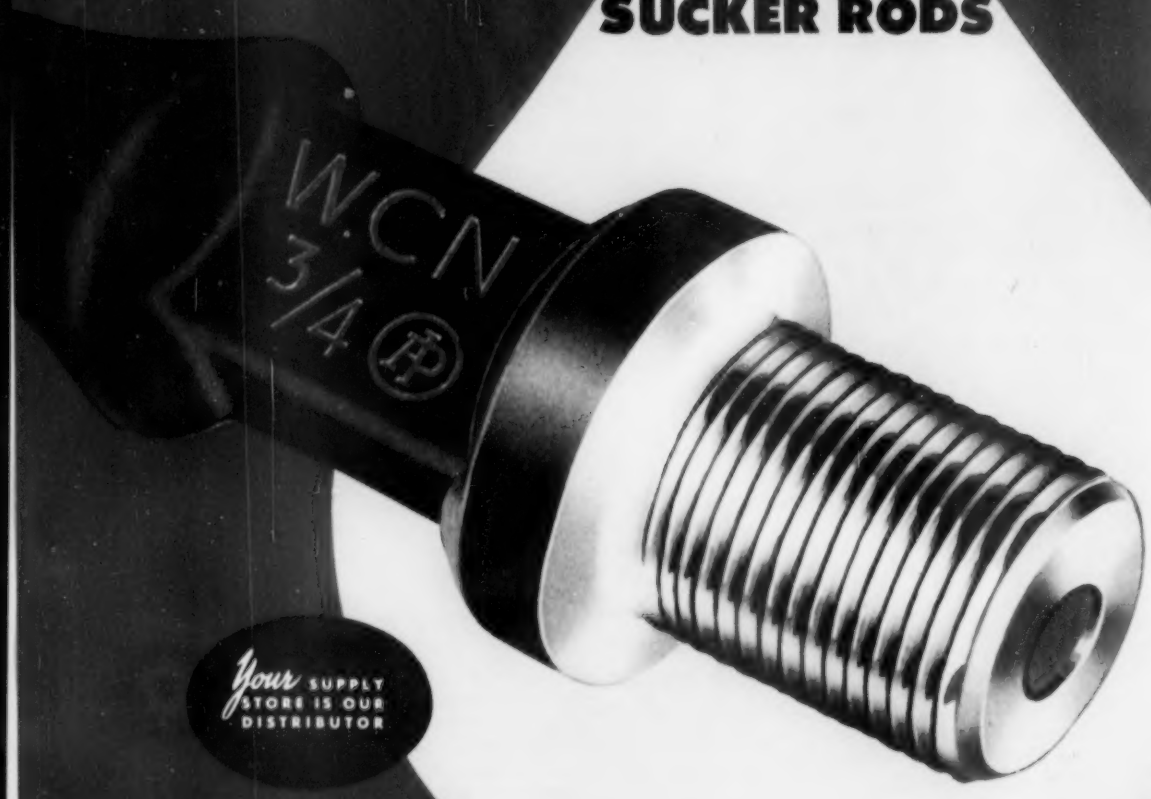

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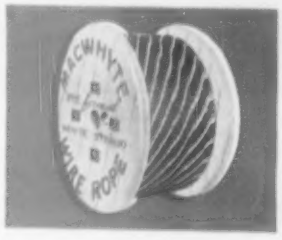

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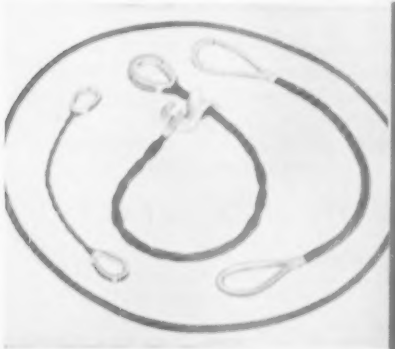

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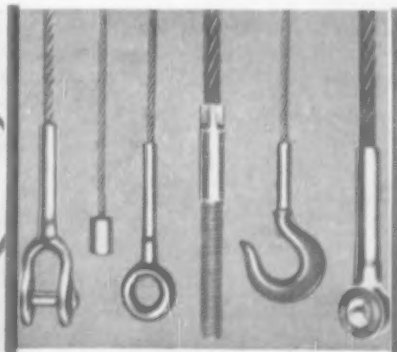

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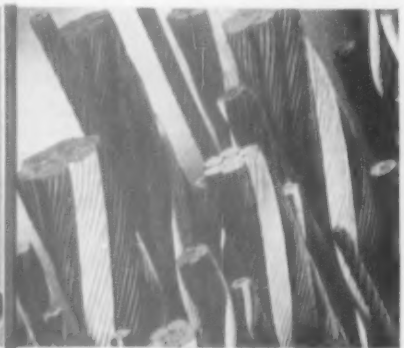

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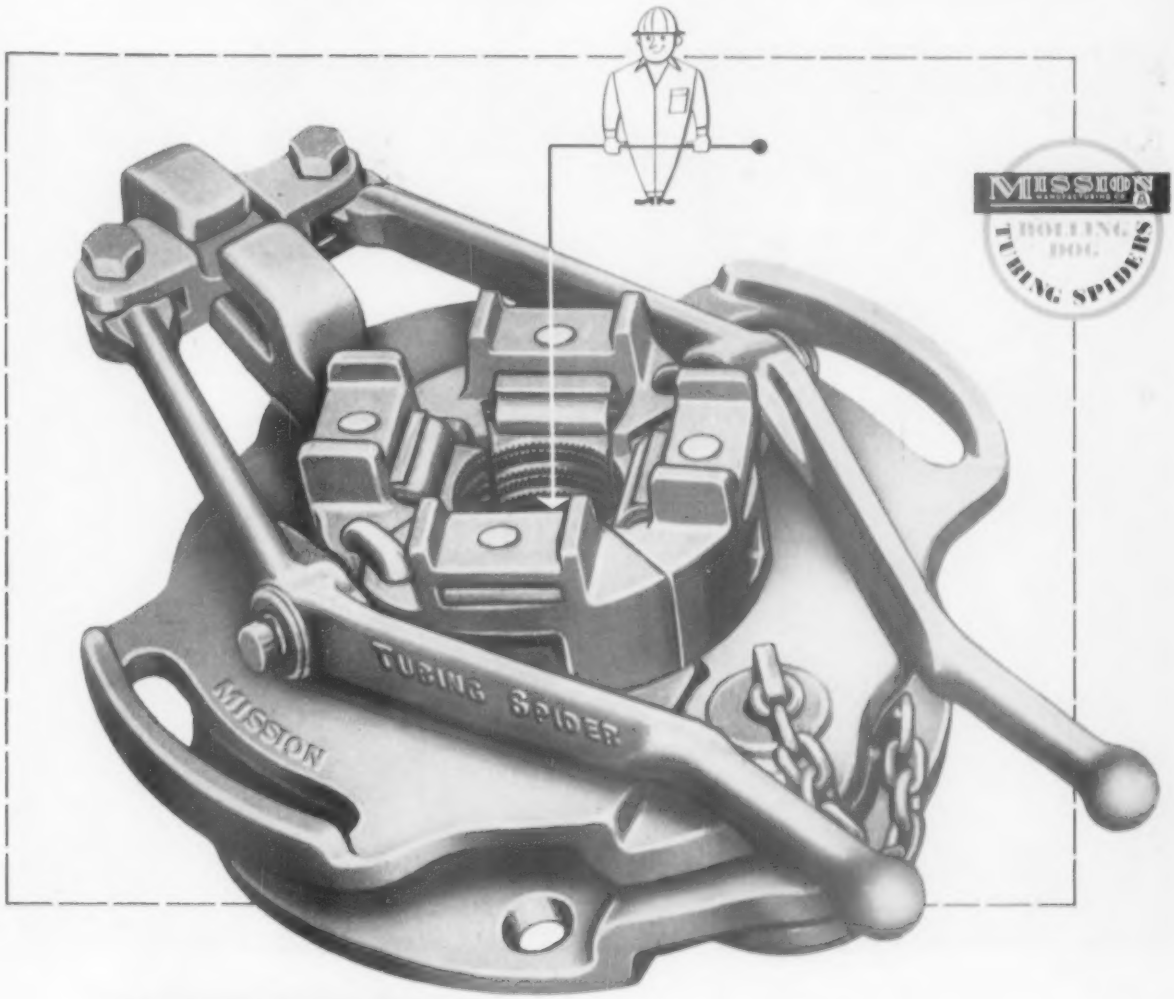

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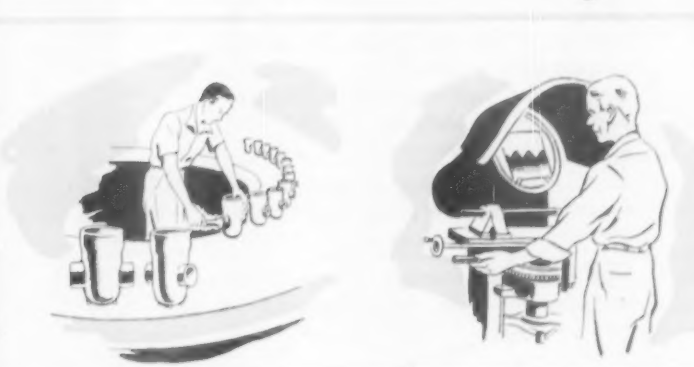

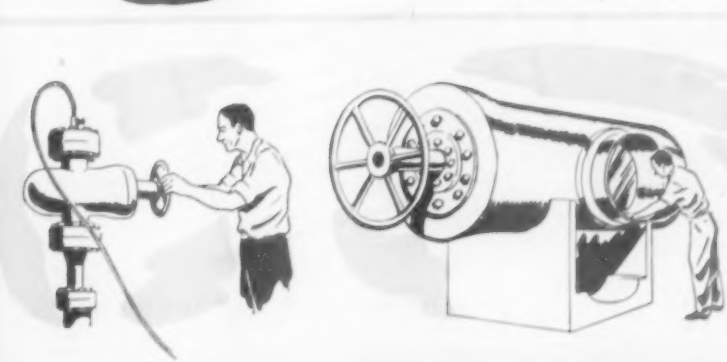

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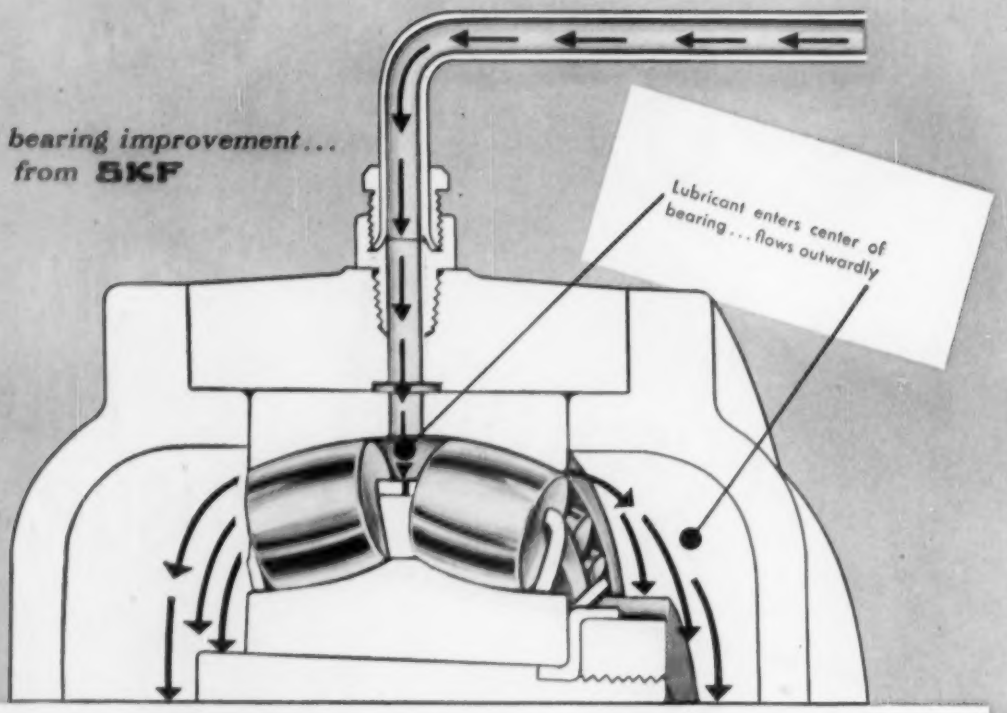

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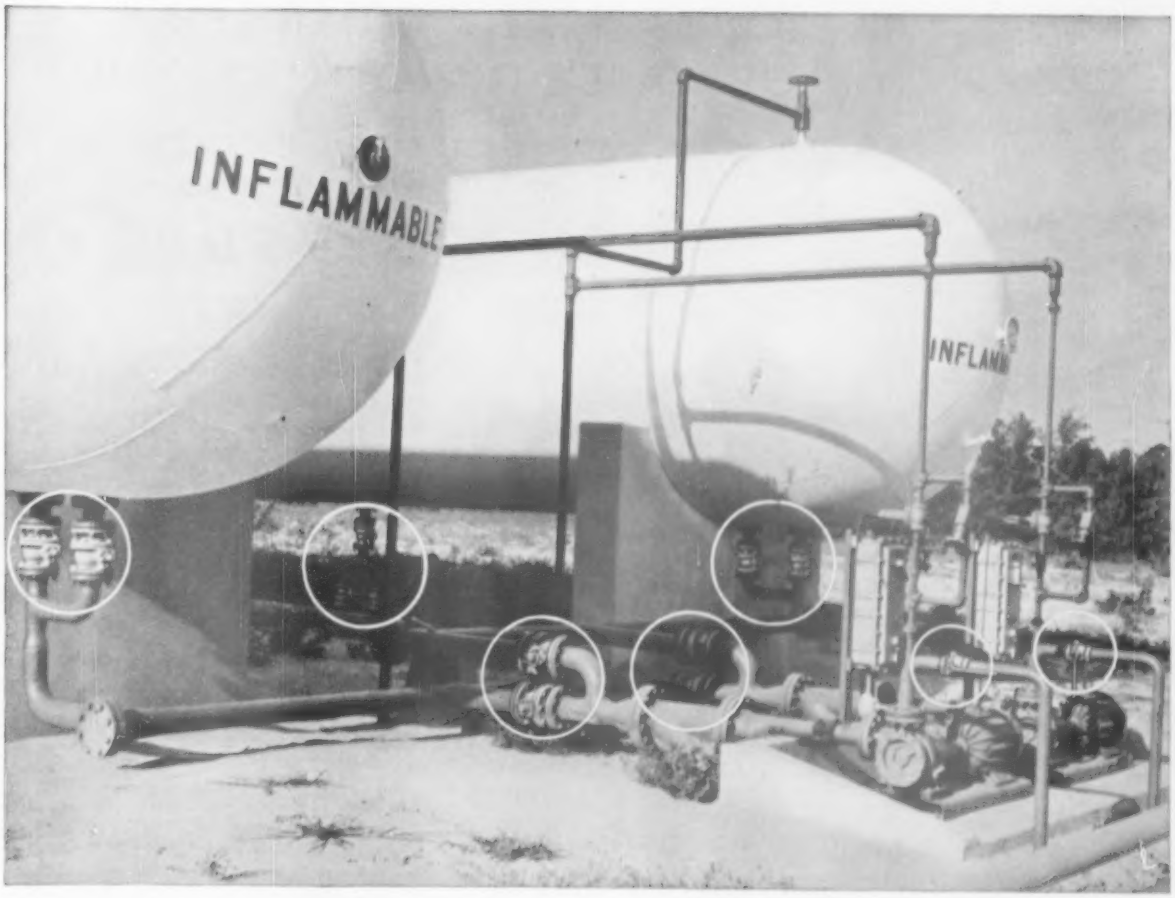

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Zone ..... *State* .....

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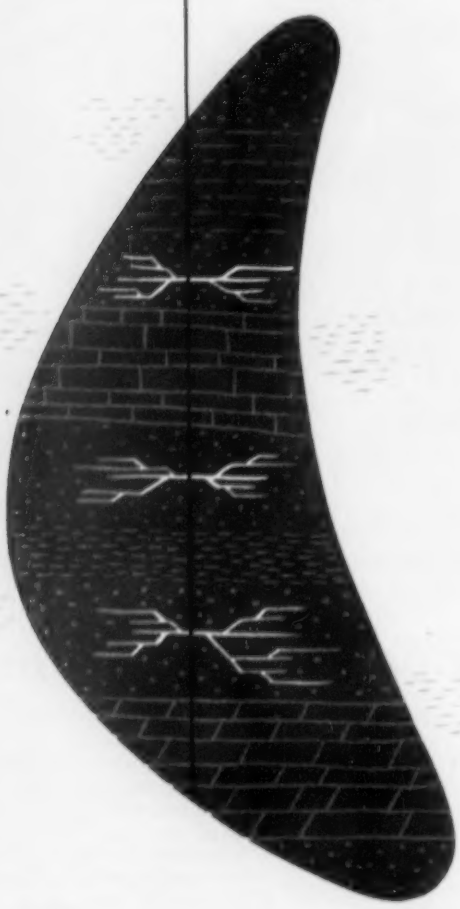


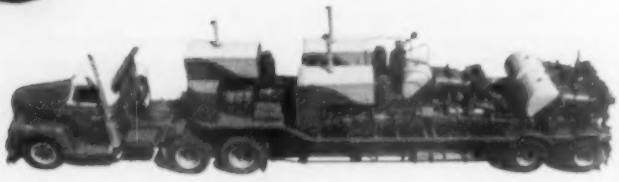
HALLIBURTON'S VIS-O-FRAC

Now an inexpensive fracturing job can be done without exposing pay formations to possible harmful effects of water entry into oil zones. For increased production at minimum cost, Halliburton's Vis-O-Frac process uses lease crudes. But this is not an emulsification process. Vis-O-Frac gels almost any crude to high viscosity *without* using water that might be forced into the formation. Viscosity and gel strength of Vis-O-Frac fluid permit high sand concentrations. And due to chemical composition there is no compatibility problem with formation oil or extensive clean-up operations. Halliburton sand-fluid proportioning equipment is used on Vis-O-Frac jobs to control ratio of sand to fracturing fluid in the individual program required for maximum production increase from each well. And shut-in time is cut to a new low. Vis-O-Frac is available only from Halliburton where special equipment, new techniques and the unmatched experience of more than 50,000 fracturing jobs are ready to help you. Call for more effective, more economical fracturing from your local or district office of the Halliburton Oil Well Cementing Company.

COMPLETE DATA SENT ON REQUEST

Add This Valuable Information

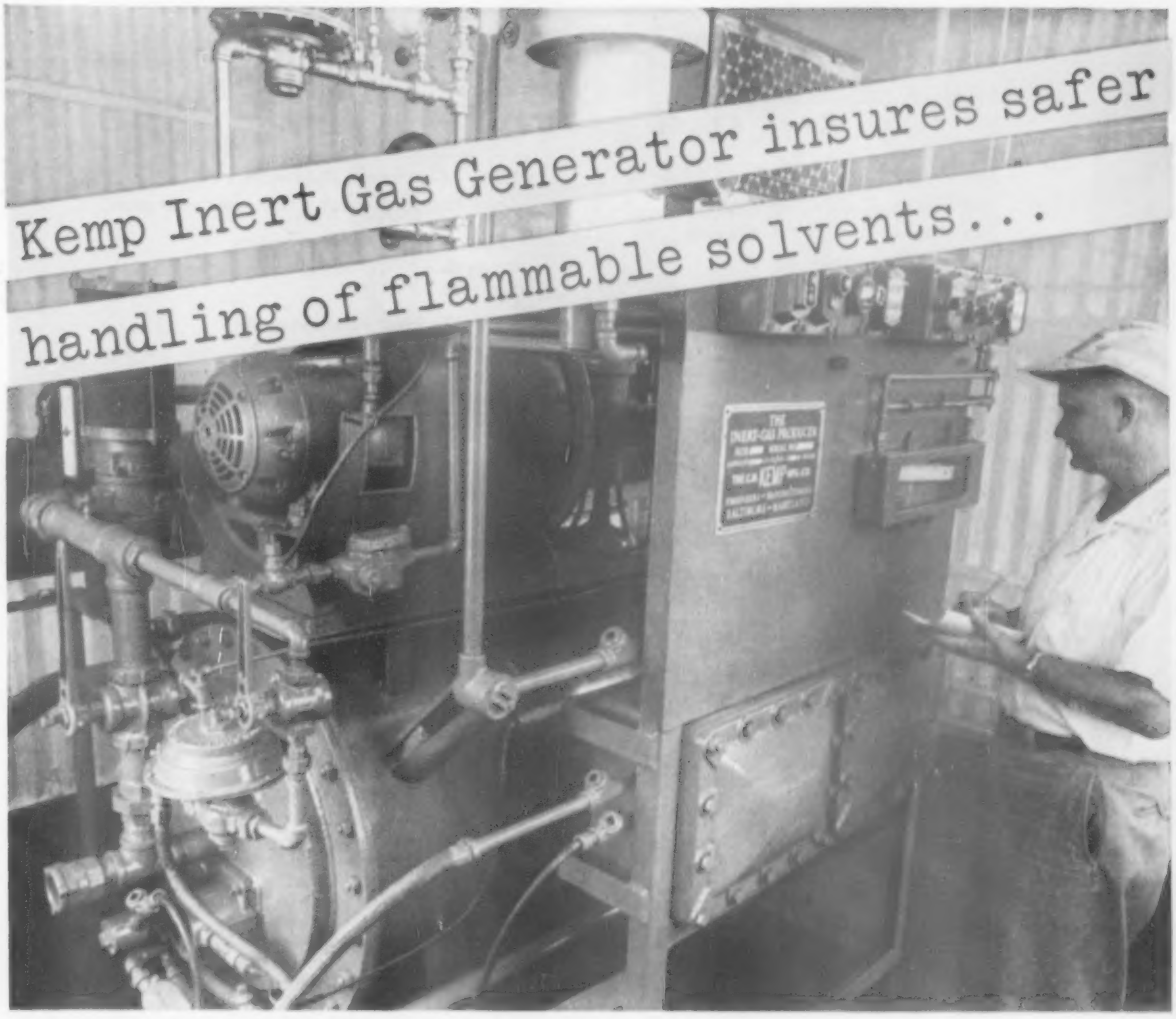
To Your Halliburton Service File



another first for

HALLIBURTON FRACTURING SERVICES

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



Quaker State reports:

Kemp Generator maintains steady inert gas supply for blanketing—even under varying load conditions!

In this Quaker State Oil Refinery, in Farmer's Valley, Pa., a Kemp 3,000 cu. ft. per hr. Generator is used to provide inert gas atmosphere to blanket vessels containing flammable solvents. Mr. Joe O. Brown, Process Engineer, says that the Kemp Generator, in use since 1949, is a big improvement over a previous model replaced by this 3-MIHE.

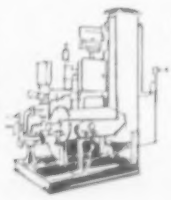
Kemp does all inert gas jobs better

Kemp Gas Generators are easier to operate, start quickly, give continuous output around the clock. Even under fluctuating loads uniform analysis is maintained. Pipelines and vessels can be purged easily, quickly, for cleaning and inspection or when processes are changed! Kemp Generators are also ideal for annealing, hardening, and sintering. Kemp has the ability to produce a chemically clean inert at a specific analysis *regardless* of demand!

Investigate NOW

Find out how Kemp Engineers can provide the most profitable answer to *your* inert gas problem! Write for Bulletin I-10 today.

KEMP
OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • DYNAMIC DRYERS
FIRE CHECKS • METAL MELTING UNITS
SINGEING EQUIPMENT

THE C. M. KEMP MFG. CO.
405 East Oliver Street, Baltimore 2, Maryland

CF&I STEEL PRODUCING PLANTS

CF&I Pueblo, Colorado

Blast Furnaces and Open Hearths producing pig iron, ingots, blooms, billets and rods.

CF&I Buffalo, New York

Blast Furnaces and Open Hearths producing pig iron, ingots, blooms, billets and rods.

CF&I Claymont, Delaware

Open Hearths producing ingots and steel plate.

CF&I Roebling, New Jersey

Open Hearths producing ingots, blooms, billets, and rods.

CF&I Brooke, Pennsylvania

Blast Furnaces producing basic, Bessemer, foundry, malleable and low phosphorus pig iron.

QUALITY IS AN "EVERY-

CF&I FABRICATING PLANTS

The quality of CF&I steel products is firmly controlled since the requirements of each product determine the analysis of the steel.

CF&I Buffalo, New York

Fine and Specialty Wire of all types including Manufacturer's Wire (Basic, Spheroidized, Annealed, Tempered, Bright and Liquor Finish, Low and High Carbon)—Welded Wire Fabric—Chain Link Fence—Galvanized Strand.

CF&I Claymont, Delaware

Flanged and Dished Heads—Carbon and Alloy Steel Plates—Stainless-Clad Plates—Nickel Lectro-Clad Plates—Manhole Fittings and Covers—Large Diameter Welded Steel Pipe—Flame Cut Steel Plate Shapes.

CF&I Clinton, Mass.

Poultry Netting—Hex Mesh Nettings—Hardware Cloth—Industrial Wire Cloth—Alloy Processing Belts—Perforated Metals—Overhead Conveying Equipment—Sliding Door (Industrial) Hardware.

CF&I Mt. Wolf, Pennsylvania

Insect Wire Screening and Industrial Wire Cloth.

CF&I Oakland, Calif.

Fish and Crab Trap Netting—Stucco Netting—Poultry Netting—Hardware Cloth—Industrial Wire Cloth—Straightened and Cut Wire—Reinforcing Tie Wire—Mechanic's Wire—Chain Link Fence—Crimped Wire.

CF&I Palmer, Mass.

Wire Rope—Wire Rope Slings—Wire, all types (see Buffalo Plant)—Wire Clothesline—TV Guy Wire—Aircraft Control Cable.

CF&I Pueblo, Colo.

Bar, Rod and Structural Products—Grader Blades and Cutting Edges—Rails and Accessories—Chain Link Fence—Woven Wire Fence—Fence Stays—Fence Posts—Corn Cribs—Welded Wire Fabric—Nettings—Grinding Balls and Rods—Screen and Grizzly Bars—Rock Bolts—Galvanized Strand—Clothesline—Barbed Wire—Manufacturer's Wire (Basic, Chain, Spring, Stapling, Weaving, Welding)—Merchant Wire (Annealed and Galvanized)—Nails—Bolts—Nuts—Spikes—Seamless Casing and Tubing.

CF&I Roebling, N. J.

High Carbon Steel Wire (Hard Drawn, Spheroidized and Tempered)—Rope Wire—Tire Bead—Hose Wire—ACSR Core Wire—High Carbon Spring Steel Wire (All grades, tempers and finishes)—Regulator, Sash Balance and Flapper Valve Wire.

CF&I Roebling (Trenton), N. J.

High and Low Carbon Flat Wire (All tempers, edges and finishes)—Brush, Corset, Casing, Heddle and Drop Wire, Umbrella Wire and Tape Lines—Wire Rope—Strand, Aircord and Fittings—Wire Rope Slings—Electrical Wire and Cable and Magnet Wire.

CF&I So. San Francisco, Calif.

Galvanized and Annealed Merchant Wire—Galvanized and Annealed Stone Wire—Bale Ties—Baling Wire—High and Low Carbon Wire—Galvanized and Annealed Wire—Copper Coated Wire—Rope Wire—Welding Wire.

CF&I Worcester, Mass.

Valve and Clutch Springs—Starter Springs—Tire Chain Adjusters—Cross Chain Repair Links—Mechanic's Wire—Compression, Extension and Torsion Springs of all types—Formed Wires.

STEP" OPERATION at CF&I

THE COLORADO FUEL AND IRON CORPORATION

DENVER • OAKLAND • NEW YORK

There's only one positive way to make sure that steel products will give long-lived, trouble-free service. That's to start with a system of rigid quality controls even before the iron ore goes into the blast furnace—and constantly maintain these controls throughout every stage of production until the product is shipped.

This is the policy at CF&I. Quality control is an "every-step" operation which is part of the job at every CF&I plant.

What's more, CF&I offers you another important advantage—a widely-diversified line of steel products from one source which enables you to get the exact size and type of product that's best for your particular job.

Next time you're in the market for steel or steel products, it'll pay you to contact CF&I.

3490

"We got

Bill Williams, tool pusher, says "We've used a number of different drilling lines but we've never found one better than Tiger Brand for low ton-mile costs."
Barge Rig of C. A. Norton Drilling Company on Lake Salvador, St. Charles Parish, Louisiana.

32,824 ton miles with one Tiger Brand Rope"

"According to ton-mile records, we've never had a better rope than Tiger Brand,"

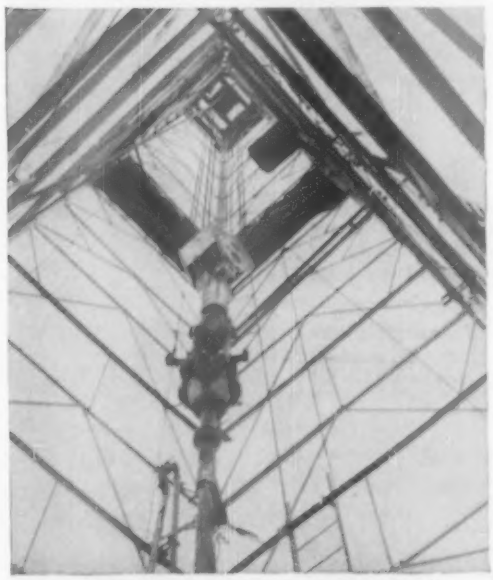
says Mr. W. C. Williams, Tool Pusher for Norton Drilling Company, New Orleans, La.

The Norton Drilling Company Rig No. 5 is an inland marine barge of the split-hull type designed for shallow water. It was drilling about 30 miles south of New Orleans when these photographs were taken.

The rig was equipped with a 2,500-foot Tiger Brand 1¼", 6 x 19, IWRC drilling line. This had been in service about eight months drilling 68,277 feet of hole for a total of 32,824 ton miles. The rope had been cut back at the drum regularly in the course of service . . . a practice which paid off in longer rope life and lower costs.

Norton Drilling Company keeps accurate ton-mile records which they consider to be the best method for judging the life of wire rope. That's why they used Tiger Brand on this important barge rig where any shut-downs would be extremely expensive.

Why not prove it to yourself? Send the coupon for one of our free Ton-Mile Calculators. Then rig up with Tiger Brand and check its performance *on your own rig*. We're sure you'll be back for more Tiger Brand Line.



One Tiger Brand Wire Rope drilled five wells averaging about 10,000 feet each and there was still plenty of service left in it.

AMERICAN STEEL & WIRE
DIVISION
UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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Room P-46, Rockefeller Building
Cleveland 13, Ohio

☐ Rush me one free Tiger Brand Ton-Mile Calculator.

☐ Have your representative call to show me how this calculator can help me cut line costs.

Name .....

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USS AMERICAN TIGER BRAND WIRE ROPE

USS

Excellay Preformed

UNITED STATES STEEL

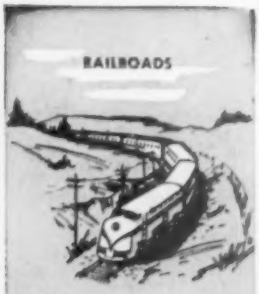
BRONZE • STEEL • MONEL • ALUMINUM

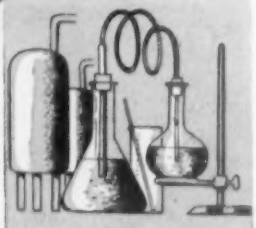
swing joints

YOU CAN ALWAYS DEPEND ON . . . . .

for unlimited flow line flexibility, greater load carrying capacity!

The high standard of OPW's Swing Joint performance results from expert designing, precision machining, exclusion of contamination, simple lubrication requirements, soundness of load carrying principle and perfect alignment at all times.





A wide range of styles and sizes makes possible many and varied applications for safely handling liquids of diversified viscosity at required temperatures and working pressures.

Exhaustive field research has directed OPW in planning a complete line of Swing Joints to fit all requirements.

FREE CATALOG F-8
provides engineering data, sizes, styles, recommendations and prices.

OPW CORPORATION
2731 Colerain Ave.
Cincinnati 25, Ohio

Here's how one Armco Building does two jobs

Unique STEELOX Panel construction makes it easy to vary the inside finish to meet different needs. Warehouse space can be plain, office can be more elaborate.

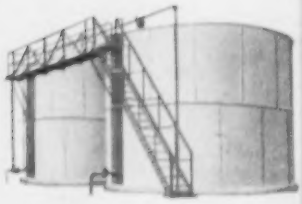
Storage and office space under the same roof. That is a requirement of many buildings in the oil country. And an Armco Steel Building provides the features that make it easy to meet those needs best. Here's how.

Interlocking STEELOX Panels provide both structural support and finished exterior. Inside, the interlocking ribs of the panels form a vertical 16-inch modular framework to which any standard insulation is readily attached and finished with plaster or drywall materials. Thus the office interior can be as elaborate as you want it. In storage, or other utility-type areas, the inside walls can be unfinished or insulated and finished as desired. An Armco Steel Building provides economical, weather-tight construction with complete flexibility of interior finish. Write us for details about Armco Buildings. There is a size and type for practically any building need. Armco Drainage & Metal Products, Inc., 4626 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

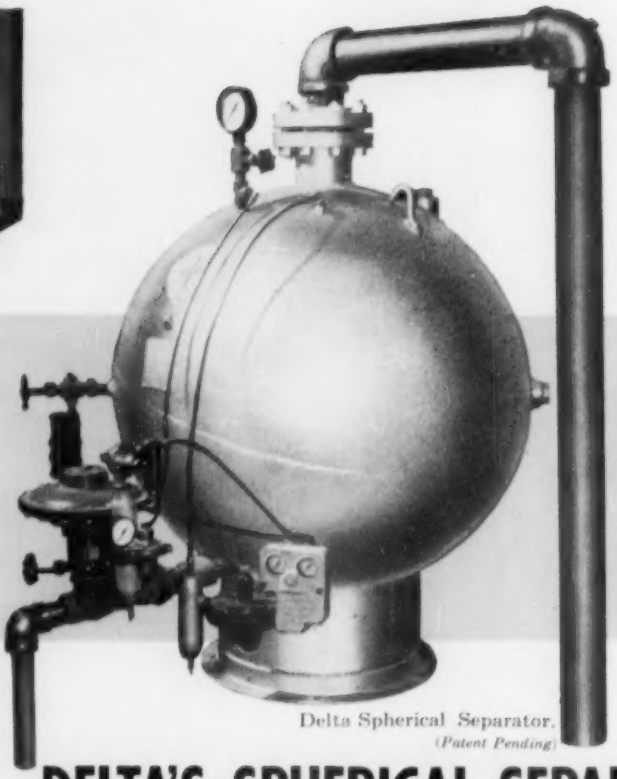
Armco Steel Buildings

ARMCO®

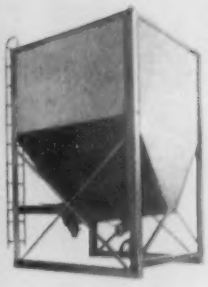
Delta Indirect Heater



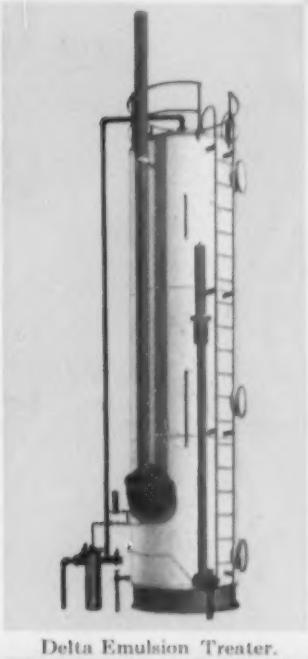
Delta Bolted Steel Tanks



Delta Spherical Separator.
(Patent Pending)



Delta Bulk
Storage Bin



Delta Emulsion Treater.

Delta's Main
Plant at
Baton Rouge, La.

DELTA'S SPHERICAL SEPARATOR

Proves its efficiency in the Louisiana Gulf Coast Area

One of the Outstanding Units in Delta's Modern, Field-Tested Line of Oilfield Equipment

The use of Delta Spherical Separators offers you at least three distinct advantages, over and above high capacity and low separation costs.

First, the Delta unit has been thoroughly proven by wide usage to be well-adapted and giving excellent service in field conditions encountered in the Gulf Area. You know what to expect from them in cost, output, service, and maintenance.

Second, they can be easily obtained from any one of four convenient locations—Lafayette, Westwego and Shreveport, Louisiana, stocking points, or the main plant at Baton Rouge.

Third, when need arises, emergency service and spare parts can be furnished promptly by the Delta people from these four sources of supply

The field-tested and proved Delta line also includes three-phase separators, treaters, heaters, low temperature extraction units, specially designed and packaged off-shore production units, and bulk handling equipment.

You are invited to write, call or wire for details.

DELTA TANK MANUFACTURING CO. INC.

EXECUTIVE OFFICES: BATON ROUGE, LA.

111 Bridge City Ave.	Scott Road	Choctaw Drive	Delta Tank Mfg. Co., Inc.
Westwego, La.	Lafayette, La.	Baton Rouge, La.	Minden Highway
Phone: UNiversity 3625	Phone: CEnter 4-2345	Phone: 7-2224	P. O. Box 5427 Bossier City, La.

EXPORT OFFICE: International Trade Mart, New Orleans, La.

FABRICATORS OF PRESSURE VESSELS AND OIL FIELD EQUIPMENT

NEW...

Bonus Powered too!

NEW

124 Net Engine Horsepower. In International Drott Machines, Engine develops 134 Net Horsepower.

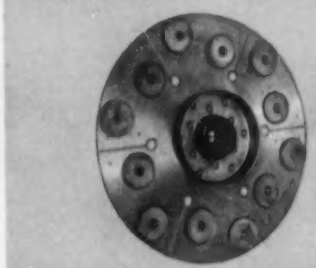
182 Series

TD 18

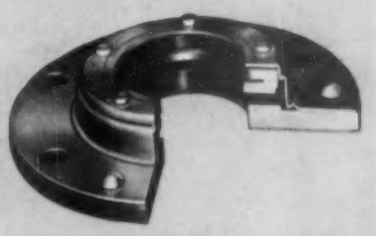
TD-18 diesel (series 182) delivers 103 drawbar horsepower, with weight of 29,050 pounds (without equipment). All-weather electric starting, standard equipment. "New look" visibility, operating ease never before available. New heavy-duty, swinging-door type radiator guard is "standard"—for carrying heavy front-mounted equipment. Gives big tractor performance in pioneering under roughest conditions. Powers 3-yard International Drott Skid-Shovel, anywhere.

No costly delay from a "killed" or cold engine—you start fast! Famous International *gasoline-conversion* diesel starting—*actual* "in-seat" starting—is *standard equipment* on this new crawler line. With "push-button" ease, you get seconds-fast starting, whether the engine is cold, or stopped! And you're on the job seconds-fast, when minutes are dollars.

Cerametallic Engine Clutch Facings save power, defy heat, prolong life! Uncomplicated, *familiar-to-all* engine clutch design of these new crawlers have *power-holding, heat-defying, long-lasting* Cerametallic facings. These facings reduce lever-pull up to 50%, provide amazing heat immunity, add service freedom, cut upkeep!



Now . . . 500-hour lube intervals with new metal-to-metal, track roller seals! You save the time and expense of frequent inspections or lubrications, with the new *full-floating*, cartridge-type, track roller seals provided on the TD-24, TD-18, and TD-14. These precision-lapped, metal-to-metal seals are so effective they give you *safe* 500-hour intervals between roller lubrications!

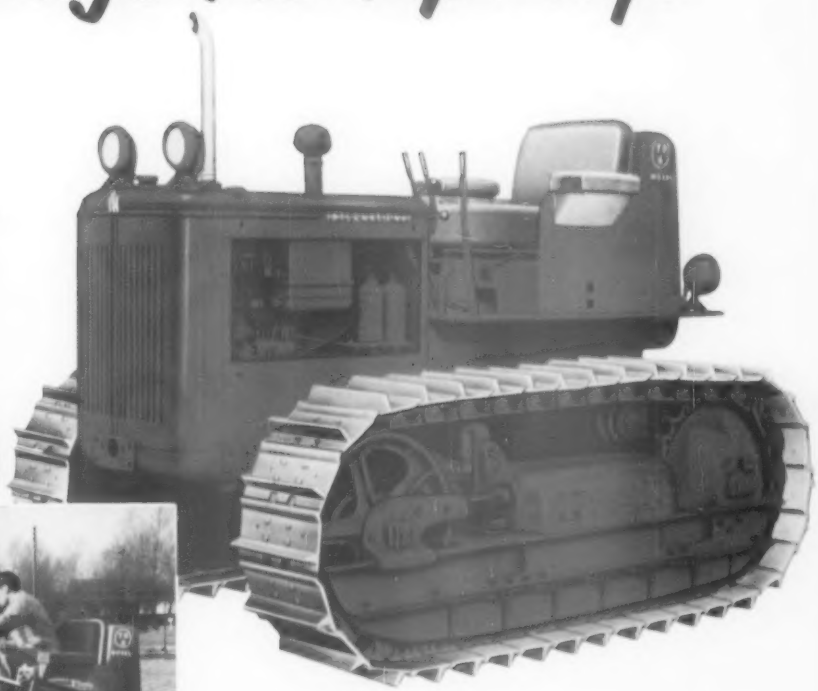


Steps up a size... in job range and capacity!

50 Net Engine Horsepower. In International Drott Machines, Engine develops 55 Net Horsepower.

61 Series

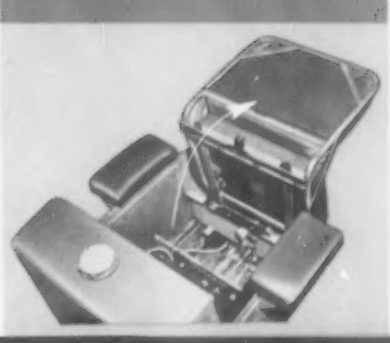
TD 6



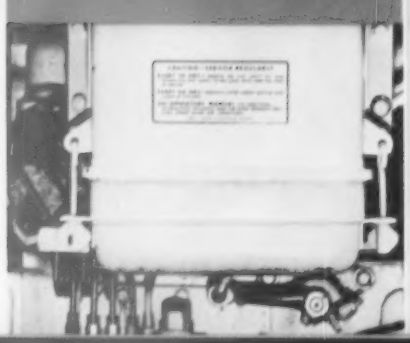
TD-6 diesel (series 61), 41.5 drawbar hp, up 23%! Steps up a whole size in work capacity and earning ability. Operating weight (5-roller model), without equipment, 8,890 pounds. Powers 1-yard International Drott Skid-Shovel or Four-In-One; serves as clean-up dozer unit on any-sized contract; versatility and low operating cost to do many sizes of jobs for every size of contractor.

Full-view, one-glance panel saves time—cuts effort! One quick glance at this new full-view panel, with centralized instrument grouping, gives the operator the instant check-up, to assure that lubrication, generator, and cooling system are "perking" for full production!

New Fold-over Seat Aids Fast, Centralized Servicing! New fold-over seat of the TD-6 and TD-9 models allows operator to give you the time and convenience advantages of centralized steering clutch assembly servicing. Lubricant fittings are conveniently grouped and fully accessible!



Thorough air filtration assured by new under-hood cleaner! Instead of being "in your lap," or a knee-bumping obstruction, air cleaners of the new International crawlers are side-mounted—for easy accessibility, yet out of the way. They have big capacity and high efficiency, too, for positive air filtration!



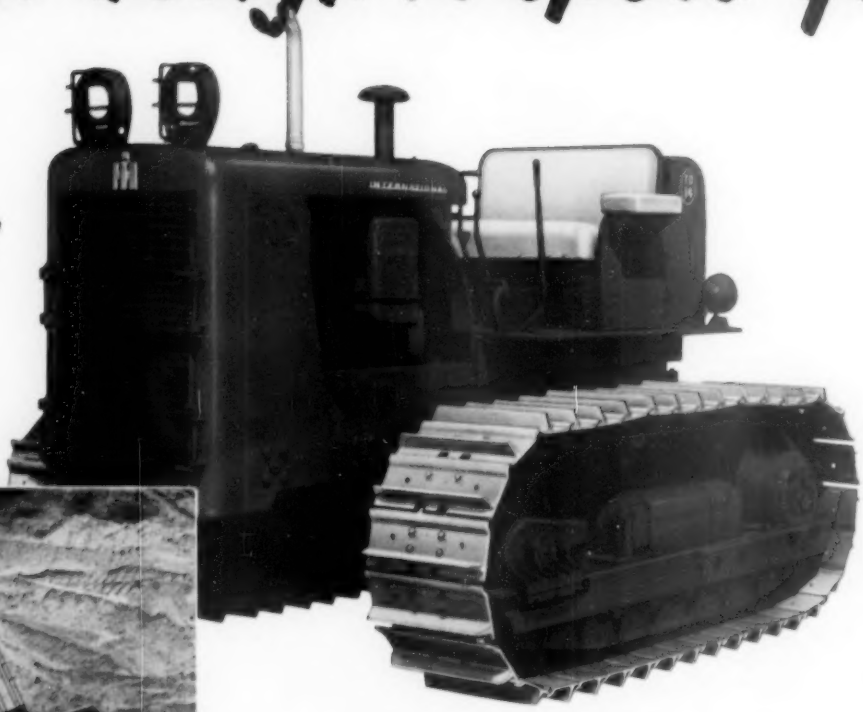
International® Crawlers giv

plus new design to speed yo

95 Net Engine Horsepower.

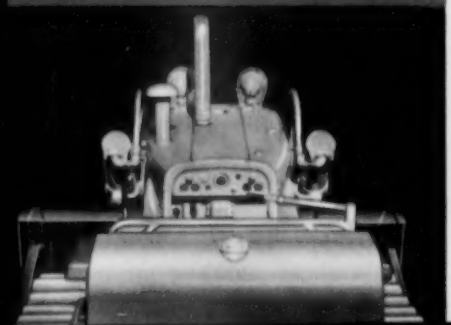
142 Series

TD 14

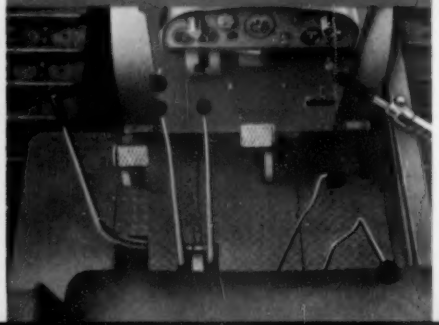


TD-14 (series 142), 78.5 drawbar hp; weighs 21,095 pounds (without equipment). Features "new look" engineering, job-speeding visibility, new equipment-carrying and operating strength. All-weather electric starting, standard equipment. It's a fast, responsive, big-capacity dozing tractor. Powers 2¼ cu. yd. International Drott Skid-Shovel or Four-In-One; 15-ton capacity Superior Pipe-Boom; other similar-sized equipment.

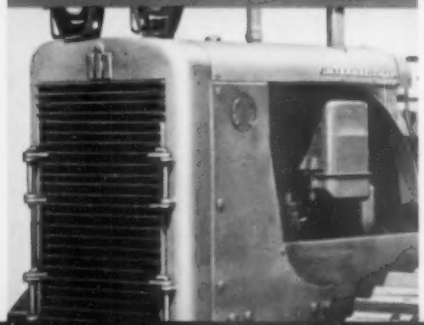
Control Tower Visibility adds operating efficiency! See how new International crawlers are streamlined for complete job-control visibility. Seat is amply high to provide full view of equipment, terrain, and variations requiring operator action, to maintain efficiency.



Clean, safe deck cleared for action! Look down on that safe, clean, flush deck —a platform for full production. The wide, man-size seat is fully-adjustable; foam rubber padded. Instruments centralized for one-glance check-up! Even a cigarette lighter is provided, to prevent needless stops!



Pressurized Closed Cooling System for Positive Performance Protection! New pressurized cooling systems provide fast warm-up under thermostatic control—and positive *ideal temperature control* with forced circulation through full-length jackets. That aids clean combustion, guards oil film strength, protects performance. Radiator core assembly is easily-removable, without disturbing radiator guard or mounted equipment.



...ive you Bonus horsepower—
...our jobs, control your costs!

66 Net Engine Horsepower. In International Drott Machines, Engine develops 71 Net Horsepower.

91 Series

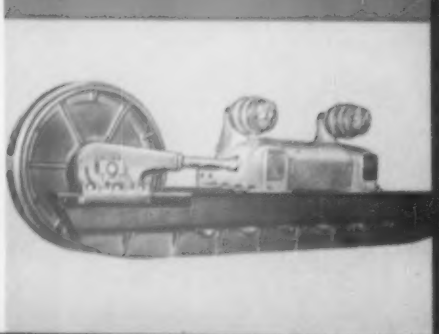
TD 9

TD-9 diesel, (series 91), delivers 54.5 drawbar hp—up 32%. Operating weight (5-roller model), without equipment, 12,000 pounds. Now up in a new heavy-duty job range. New power is backed by new power train and track frame strength, new operating and servicing ease. Powers International Drott 1½ cu. yd. Skid-Shovel and other equipment requiring similar power.

480-hr. full-flow lube oil filters guard bearings, cut upkeep! Every drop of oil on its way to lubricate moving engine parts must pass through these new abrasive-trapping micron-type filters—with the capacity, strength, and efficiency to give 480 hours of wear-fighting, upkeep-cutting duty!

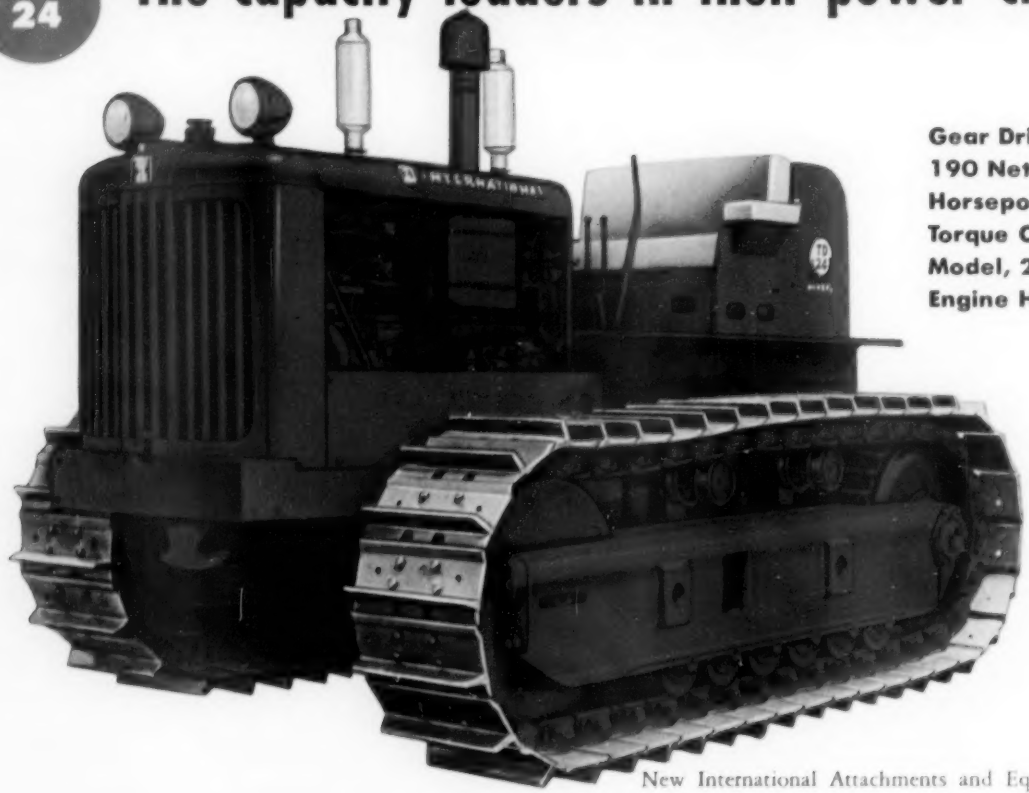
Hydraulic Power Steering Inspires Operator Cooperation! New hydraulic power steering of the TD-14 and TD-18 cuts operator fatigue—and along with the other big effort-saving advantages, makes it easier than ever to deliver full-capacity production! TD-6 and TD-9 have spring boosters to lighten the operator's job.

"Bridge-strong" track frames for "slam-bang" conditions! You are looking at the strongest track frame in the industry for crawlers of TD-18 and TD-14 size! Heavy steel box-section beams, weld-joined to heavy stress-relieved steel plates—and rigidly gusset-braced—they're your foundations for record-making "rough-and-tumble" performance!



TD 24

The capacity leaders in their power class



Gear Drive Model, 190 Net Engine Horsepower
Torque Converter Model, 200 Net Engine Horsepower

Massive—with 43,080 pounds of rock-dozing, scraper-pushing brawn (7-roller torque converter model)*—the TD-24 can give them all a lesson in operating ease, big capacity, and positive load control! Has instant high-low range and exclusive Planet Power steering to give you its tremendous *pushing*, *pulling*, and *lifting* power on any terrain—with responsiveness not available elsewhere! *Live power on both tracks, on every turn!* Backed by equipment engineered to match its strength and power!

*Gear Drive 7-roller model weighs 42,780.

New International Attachments and Equipment team with new bonus-powered crawlers to give you high-producing performance packages: 42 new Bulldozers, to fit your needs exactly . . . 4 new Drott Loaders, 1 to 3-cubic yard capacity . . . 4 new Superior® Pipe-Booms, 8 to 55-ton capacity; 3 job-proved PCU'S! . . . **Measure . . . compare . . . prove to yourself . . . new bonus-powered International crawler tractors beat anything else on tracks! Try this turnpike-paced new power for capacity, operator preference, profit potential. Ask your International Industrial Power Distributor for a bonus-powered demonstration *to your specifications!***

INTERNATIONAL HARVESTER

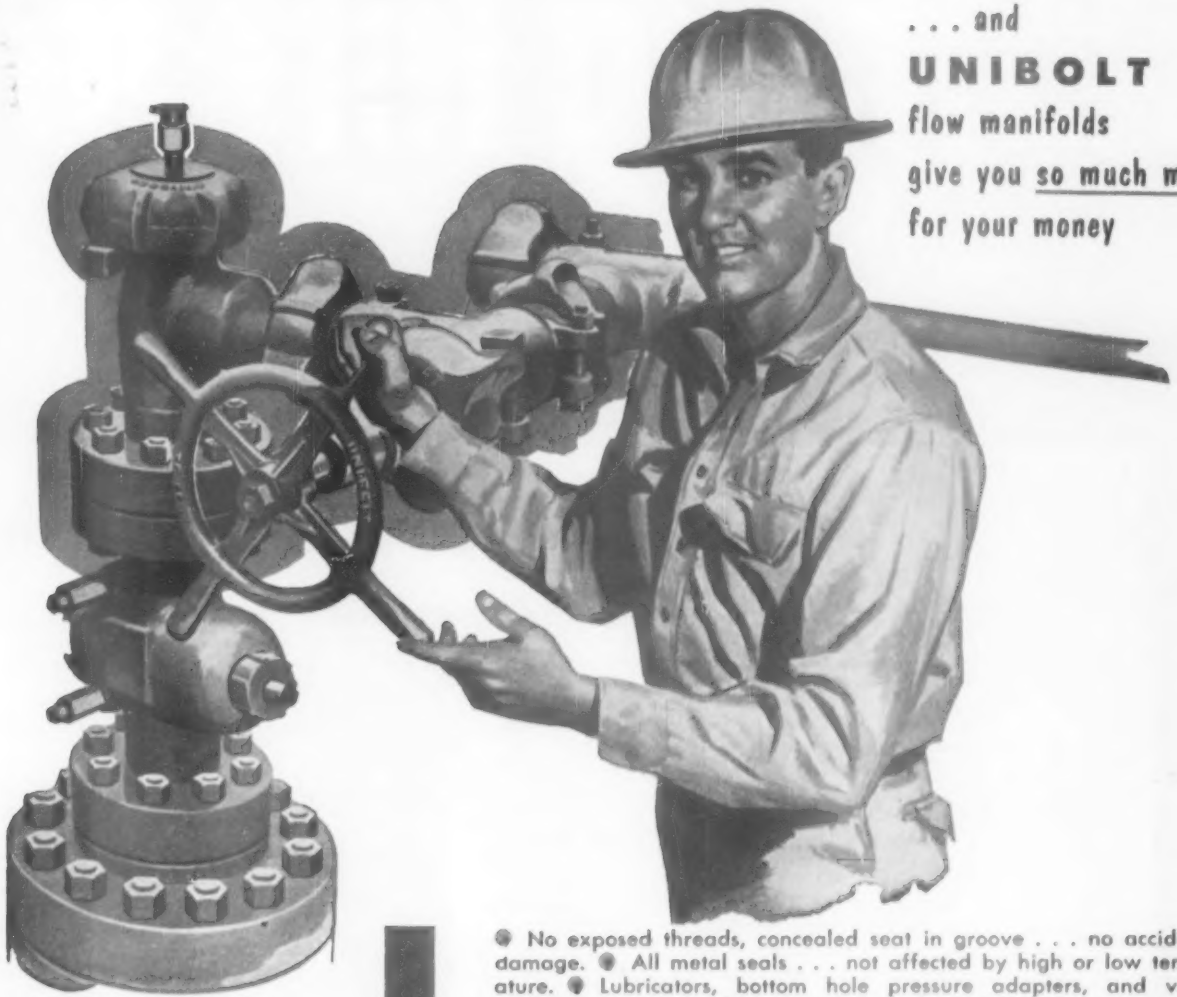
International Industrial Power

INTERNATIONAL HARVESTER COMPANY, 180 N. Michigan Ave., Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Tractor and Rubber-tired Loaders . . . Diesel and Carbureted Engines . . . Motor Trucks.

It costs so little more to "go first class"

. . . and
UNIBOLT
flow manifolds
give you so much more
for your money



Pressure-tested as a unit and available in a full range of pressures:

3000 lbs. w.p.
5000 lbs. w.p.
10000 lbs. w.p.

and in "SA" stainless steel for corrosive conditions.

● No exposed threads, concealed seat in groove . . . no accidental damage. ● All metal seals . . . not affected by high or low temperature. ● Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt Tee. ● Tee cannot be accidentally opened. ● Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in Tee if desired. ● Wing Valve requires no grease to effect seal. ● Variable opening speeds up initial clean-up or running initial flow tests . . . saves rig time. ● Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. fluid per day with 100 lbs. pressure drop. ● Valve stem packing needs no tightening . . . stem turns freely under high pressures. ● Threads on stem not exposed to internal or external damage . . . full 2½" pilot for true stem alignment and rigidity. ● Stem seat sealed by power threads and metal gasket assures alignment. ● Nitride hardened stem and stem seat . . . resists corrosion. ● Choice of hard chrome plated or "SA" stainless stems and seats. ● Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated. ● Shaped entrance on beans prevents paraffin clogging. ● Positive Choke Body may be replaced with inexpensive tee and cage nipple, or can be converted to Adjustable Wing Valve by substituting two parts. ● Streamlined flow . . . no obstructions . . . no turbulence.

THORNHILL
P. O. BOX 1184

UNIBOLT

CRAVER CO.
HOUSTON, TEXAS

Nothing left to

. . . with the new CUTLER-HAMMER

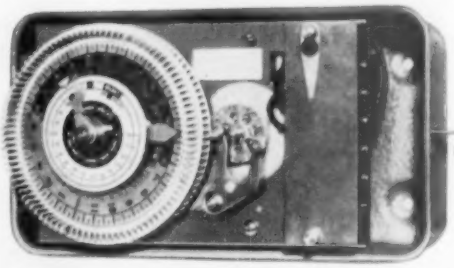
Cutler-Hammer has long set the pace in oil well pumping control. And now the *new*, brand new, Cutler-Hammer Three-Star Oil Well Pumping Control steps out *far* in advance of anything else offered. It leaves nothing to chance . . . to be so completely automatic and so completely dependable that it can be relied on to pump wells *indefinitely* without attention as far as the programming or electrical equipment is concerned.

The heart of the new Cutler-Hammer Three-Star Oil Well Pumping Control is the *new* Cutler-Hammer Supertimer. It not only provides the means for setting the desired pumping schedule (hours per day and days per week), but it provides for the *definite* sequence restarting of pumps after any power outage. There can be no uncertainty, no unfortunate coincidental restarting of even two pumps to cause overload troubles. Nothing left to chance!

This new control is not only protected against lightning; it also protects the motors against single-phasing which often results from lightning. It is designed for cool operation in the most blistering heat. Bugs, sand, rain or ice cannot enter the enclosure. The new Three-Star Control components have dust-safe vertical contacts which have been so improved that they will *never* require maintenance care or expense. Nothing left to chance!

Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve you. Order from him today. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

New Cutler-Hammer Supertimer



A. Sets restarting time delay accurately in 2.5 seconds increments from zero to 180 seconds.

B. Sets daily pumping schedule; 24 hours divided into 15 minute increments for timing of each day's pumping.

C. Sets weekly pumping schedule; control can provide pumping 1, 2, 3, 4, 5, 6 or 7 days per week as desired.

Member American CUTLER-HAMMER MOTOR CONTROL C-H *Petroleum Institute*

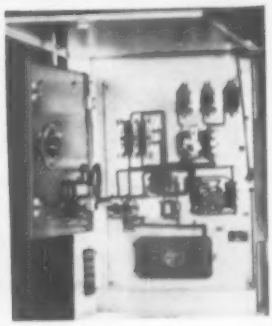
Three-Star Oil Well Pumping Control

Nothing left to Chance

The new Cutler-Hammer Supertimer not only controls the pumping schedule; it offers a selection of 73 restarting time delays in 2.5 seconds intervals from zero seconds to three minutes. This allows definitely timed sequence restarting of any numbers of pumps after any power interruption, avoids unfortunate coincidental restarts.

Nothing left to Chance

This new control provides full "dead-front" protection for pumpers. The disconnect switch can be thrown, the overload relays can be reset, the Supertimer dials can be adjusted, and test operation by manual control can all be accomplished without exposure to any live parts . . . an exclusive Cutler-Hammer feature.



Nothing left to Chance

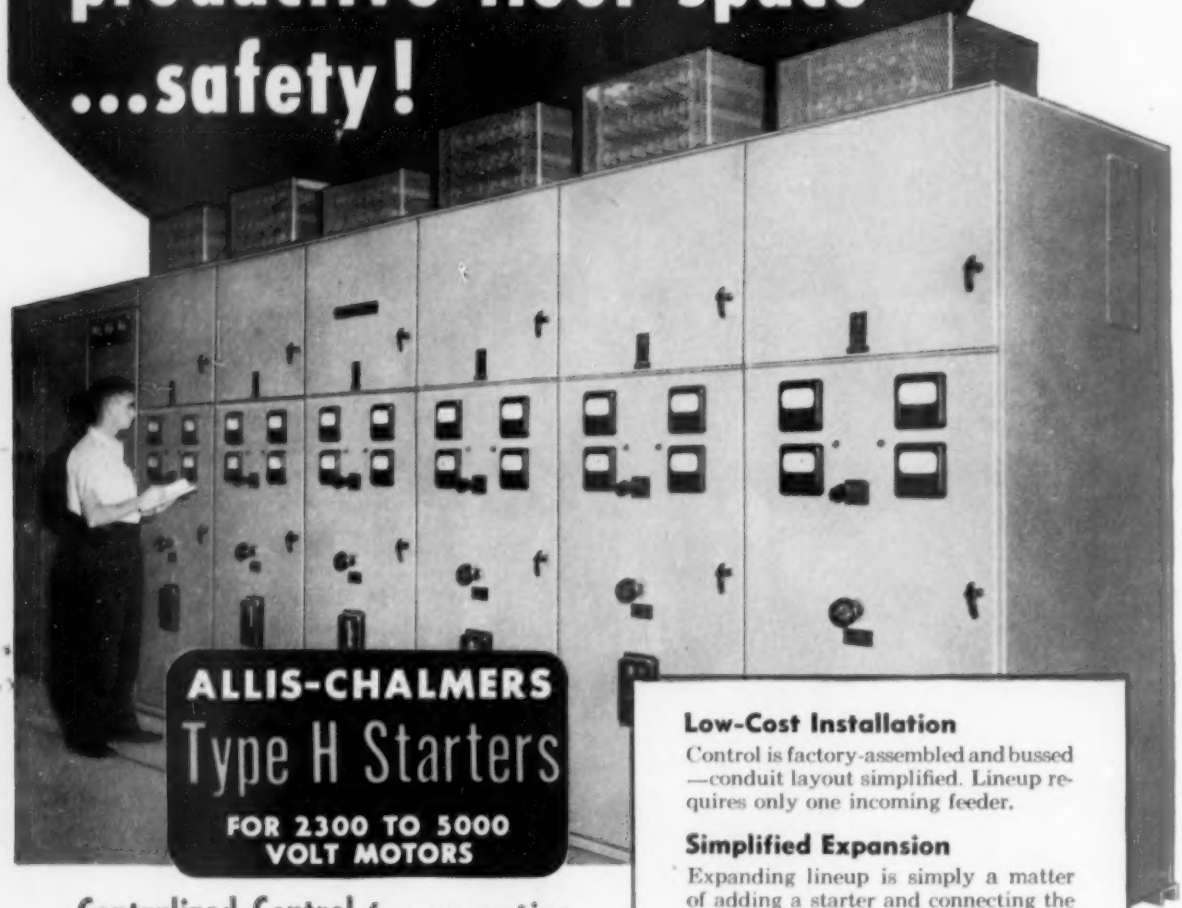
This new control provides dead-phase protection. Protection from circuit unbalance, which can also produce destructive motor heating, is obtained by the use of *three* overload relays in this "nothing left to chance" control.

Nothing left to Chance

Entirely new advanced-design power-line type lightning arresters in this new control not only provide more positive protection; they are arranged so it is impossible for anyone to inadvertently connect a lead for some special purpose in a manner which can destroy the protection afforded by the lightning arresters.

You get **MORE** when it's Built by Allis-Chalmers

...more convenience... productive floor space ...safety!



Centralized Control for an entire plant or department

Time-saving, cost-cutting convenience in planning, buying, installation, and operation are all yours with Allis-Chalmers centralized high voltage control. In addition, the factory-assembled lineup, installed in an out-of-the-way location, releases critical floor space for profitable production. From the safety standpoint, the control operates in cleaner atmosphere and can be isolated from unauthorized personnel when located in a separate control room or area.

Low-Cost Installation

Control is factory-assembled and bussed —conduit layout simplified. Lineup requires only one incoming feeder.

Simplified Expansion

Expanding lineup is simply a matter of adding a starter and connecting the bus. Each starter unit is self-contained.

Attractive Appearance

Uniformity of cubicles presents modern, streamlined appearance. Concentrating control in one lineup eliminates cluttered look.

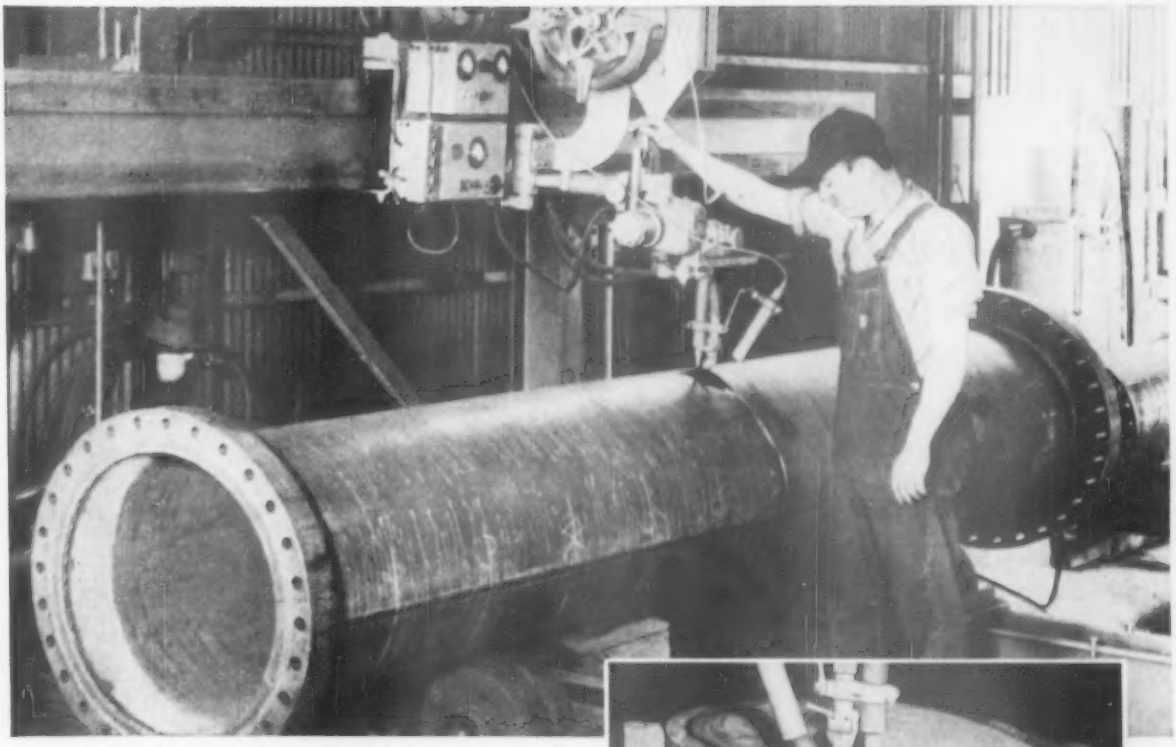
One Company Responsibility

Responsibility for assembling proper devices and for control performance rests with Allis-Chalmers.

For complete information, see your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-4978



X-RAY-QUALITY WELDS ...75% FASTER *with* UNIONMELT WELDING

Top-quality welds are a must to assure the maximum service life of parts subject to high pressure and temperature. Like many manufacturers of pressure units, the Western Supply Company, Tulsa, Oklahoma is using UNIONMELT welding to make X-ray-quality welds (in heat exchanger shells) at new high speeds.

*** HIGH SPEED:**

UNIONMELT welding speeds average 15 to 19 in. per min.—this is as much as 75 per cent faster than welding methods previously used. The steel parts welded range from ½ to 3 in. in thickness, and welds are made in from one to three passes.

*** REDUCES GRINDING:**

Since UNIONMELT welding produces smooth, flat weld beads, the need for grinding completed welds has practically been eliminated—further reducing production costs.

UNIONMELT welding is the fast, efficient method of fabricating metals thicker than 18 gage. UNIONMELT welding makes possible increased fabricating speeds and lower production costs. Learn the details—call your local LINDE Representative for more information on UNIONMELT welding, and start saving today.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

COMING SOON!

Ample supply of

PALCOTAN®
MUD CONDITIONING CHEMICAL

To meet growing world-wide demand, expanded chemical production facilities will substantially increase available PALCOTAN supply

Palcotan has come into growing demand not only throughout this country, but also in other lands. Because of its effectiveness and economy, *Palcotan* is shipped regularly even to Latin America, the traditional source of drilling mud additives imported into this country.

A little over a year ago, *Palcotan* production was first doubled, then tripled. But demand was already growing so rapidly that construction was started on a new chemical plant expansion that will provide a tenfold increase in supply. These new facilities will be in production by June of this year. The Pacific Lumber Company is grateful to the many who have cooperated in an allotment program during periods of limited supply, and is happy to announce that *Palcotan* will soon be available in ample quantity.

FOR MORE EFFECTIVE LOW-COST CONTROL OF VISCOSITY, GEL STRENGTH AND WATER LOSS

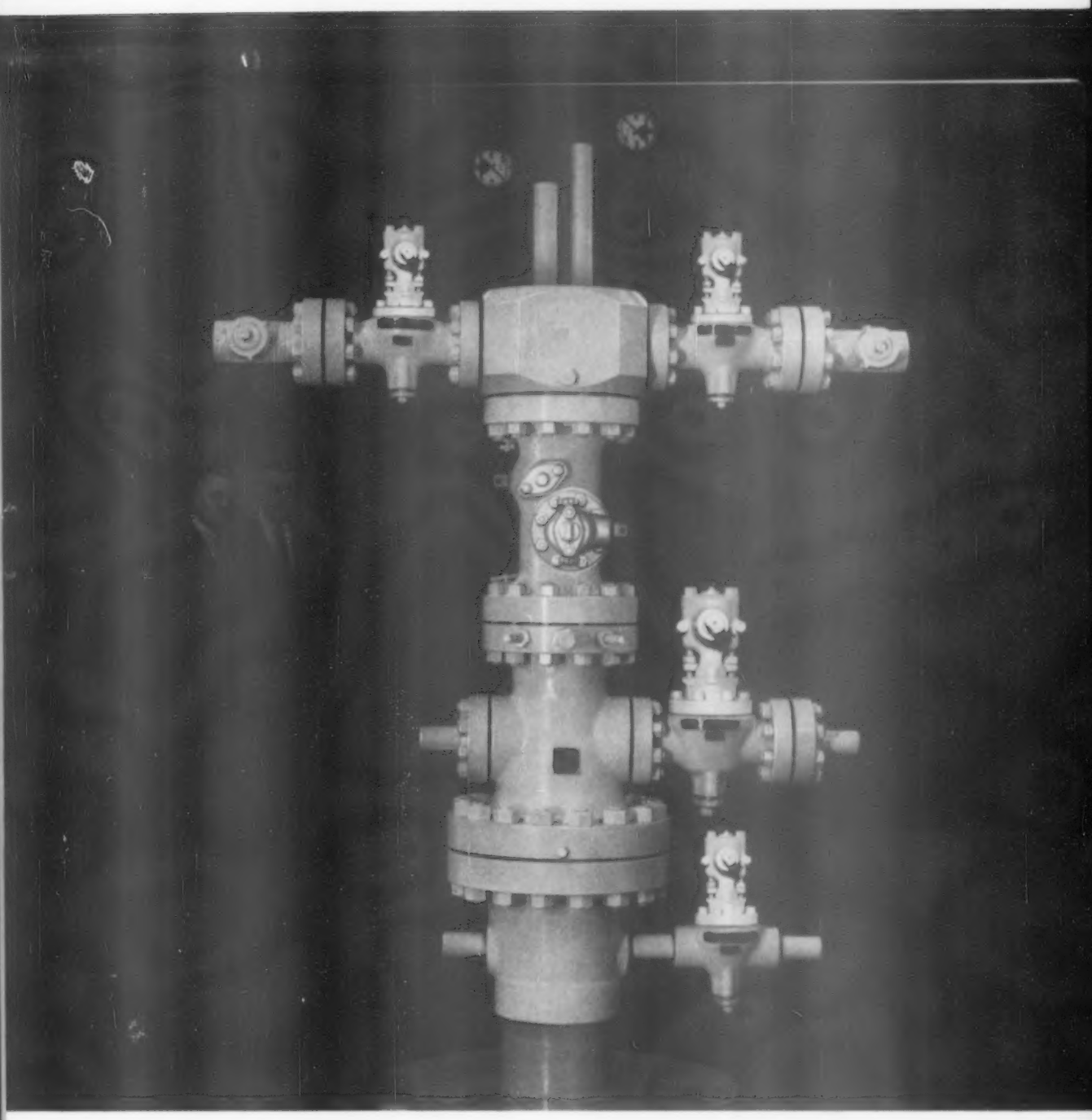
- High efficiency, especially at low concentration
- Readily soluble in cold water • pH-7 • Non-toxic
- Exceeds specifications for quebracho in many applications
- Can be added with or without caustic • Substantially lower in cost than other additives
- A stable compound not affected by atmospheric conditions
- Coarse powder form, conveniently packed in easy to handle 50-lb. multiwal paper bags

WRITE FOR BULLETIN No. 4-01 describing the properties and operating advantages of Palcotan

Available through oil field and mud service organizations

DEVELOPED THROUGH PALCO RESEARCH

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, California



Two Wells For The Price of One?

No not quite, but the economic advantage of producing from two zones simultaneously in a single well is obvious—and Cameron "DC" (Dual Completion) equipment is the most dependable protection for any producing condition.

To insure potential profits, do as thousands of successful operators have done—rely on the Cameron Closed-Pressure Method of Well Completion for utmost protection during this critical stage.

Cameron, the pioneer in multi-zone completion equipment, has now applied the many dependable features of the Closed-Pressure Method to the remarkable "DC" tree for parallel tubing strings. Suspension is completely versatile, permitting any work on either zone independently. Triple seals are the most advanced in the industry. The unique Cameron Non-Lubricated Master Valve employs the famous Lift-Plug components which may be replaced for a complete overhaul without removal from the tree and, of course, require no lubricants. The "DC" tee and caps permit every known operation to be performed with an absolute minimum of work.

Write or call to make an economical, flexible, complete completion.

Cameron

IRON WORKS, INC.

P. O. Box 1212 - Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.

WORLD LEADER IN DEPENDABLE HIGH PRESSURE CONTROLS FOR THE OIL INDUSTRY

Ray Fleming, distributor representative, busy handling supply requirements around the clock, cat-napped in his car when he could.

It Pays To Sleep On The Job . . .

When you're setting up one of Louisiana's largest rigs, night and day service from your independent distributor . . . keeps your ante low.

For nearly a month, Ray Fleming was on hand around the clock. During the day he was busy working with the tool pusher as new rig equipment was assembled and erected. At night he slept in his car at the rig to handle emergency requirements.

The rig went up rapidly and started drilling. Towering 147 feet above the alligator-infested marshlands of Louisiana's Grand Chenier Field in Cameron Parish, it is powered with 1,500 hp and equipped to drill to 20,000 feet. Today the rig is searching for rich reserves in one of the fastest developing oil areas in the country.

From the beginning, Ray realized he was the anchor man in a race with time to get the rig operating so it could start paying out. When an investment of nearly $1 million in equipment and other starting-up expenses is at stake, any delay is costly.

As the tool pusher points out, you can never be entirely sure you have every piece of equipment for the job until you actually begin setting up. Then you may need an item right away. So the mobile telephone in Ray's car was always ready.

At a word from the pusher, Ray was on the phone with the warehouse of the independent distributor he works for. Quickly and without red tape the order went in. Moments later a delivery truck with the item required from the warehouse was on its way over the oyster-shell roads through moss-hung oaks of Cajun

A swampland skyscraper, this 147-foot high rig is drilling for oil with Pittsburgh Steel's 5-inch OD drill pipe a few miles from the Gulf in southern Louisiana. Equipped by an independent distributor, it is the property of W. T. Burton Industries, Inc.

Getting instructions from the tool pusher on the drilling platform . . .

Without delay the needed part was delivered to the rig by the distributor's truck.

country, and up the plank road to the rig.

The rig and almost all its equipment—including the 5-inch OD Grade E Range 2 drill pipe from Pittsburgh Steel Company—was supplied through the independent. Ray followed through as friend and virtual working partner to see the venture launched successfully.

Once the rig was in operation, this extra service did not stop. Ray no longer had to sleep at the rig, but he kept in touch daily. Like all independents, the distributor Ray works for keeps 24-hour service available 7 days a week for even the smallest item of equipment

This is one story of service. It is typical of dozens being written all the time by representatives from the 141 stores of the independent distributors (at right) who handle Pittsburgh Seamless Oil Country Goods.

Here's why drillers get a bonus from Mr. Independent Distributor: The independent concentrates his services where he can do a thorough job, rather than spreading them out thinly over big areas. He's a local man, a personal friend of the oilmen he serves. He has a working knowledge of their problems. He can anticipate their requirements.

Because his organization is small and not run by remote control, he gets answers to big problems fast and rushes deliveries with the least paper work. Yet his business is large enough to command a broad selection of the best oil field equipment available.

His overhead is low. So the extra service he can offer comes at no extra cost. He knows how to meet and beat competition, both price-wise and service-wise. His livelihood depends on it. And the return he makes stays right in the locality where he operates.

Pittsburgh Steel Company has no financial interest in any of these distributors. Yet it backs them with more than a half century of experience and know-how in production of seamless oil country goods. It gives them the kind of quality and technical assistance they depend on for reliable service to their customers.

Next time you need a string of drill pipe, casing or oil well tubing, get the pipe of your choice through the distributor of your choice! Specify Pittsburgh Seamless!

Distributor Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland • Columbus • Dallas Dayton • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh San Francisco • Tulsa • Warren, Ohio. PLANTS: Monessen, Pa. • Allenport, Pa. Akron • Los Angeles • Warren, Ohio • Worcester, Mass.

Texas oil companies prove the value of split channel radio operation

G-E narrow band equipment serves Loffland Brothers, Standard of Texas, and Seaboard Oil Company

In the Texas oil fields they'll tell you that *practical* split channel radio operation is proving its worth right now. Two major oil companies and a major drilling contractor, operating in an area pointing north from Odessa to Vealmoor and Snyder, have cooperated in establishing three independently operated systems in a range that formerly served two firms.

Rather than share a channel when Loffland installed radio in the area covered by Standard's 48.74 MC frequency and Seaboard's 48.78 MC allocation, the three firms decided to work on an experimental split channel basis. Slight modification of G-E equipment in use narrowed the spacing from 40 KC to 20 KC, permitting Loffland Brothers' new General Electric radios to go on the air on 48.76 MC.

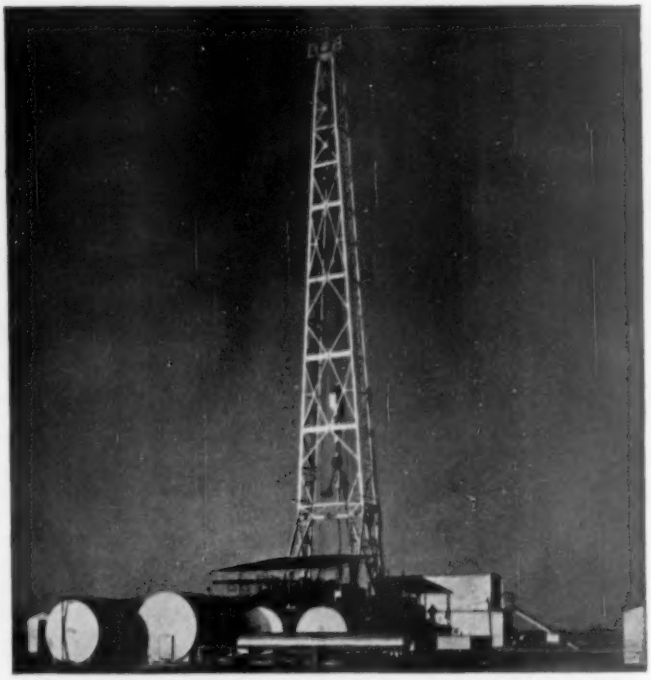
Clear channels for all

Now, each firm operates on its own frequency, without interference from either of the others. Because of split channel operation and General Electric narrow-band radio equipment, three companies benefit from 2-way radio communications without interference to one another.

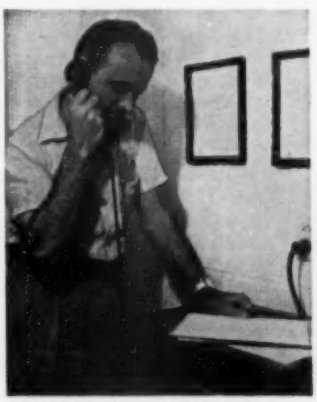
The new G-E Progress Line of 2-way radio equipment provides a complete interchangeable package. Transmitter, receiver, power supply, and optional chassis are individually rack-mounted. Plug-in design permits quick changes of frequency, power, or type of reception.

2-WAY MOBILE RADIO

Your General Electric Communications Counselor will be pleased to cooperate with you in planning a split channel operation for your company. Call him in, or write today to: *Section X846-9, General Electric Company, Communication Equipment, Electronics Park, Syracuse, New York.*



RADIO ANTENNA CAPS LOFFLAND BROTHERS' RIG near Odessa, Texas. Nine General Electric base stations and mobile radio units have cut $400 per month from former telephone costs.



STANDARD OIL OF TEXAS operates two G-E 60-watt base stations linking seven mobile units with the main base at Snyder, Texas. Radio speeds orders, makes instant decisions possible for fast action.

SEABOARD OIL COMPANY maintains instant operational contact with field locations through 5 G-E base stations. 20 mobile units coordinate widespread drill site activities in the West Texas area.

Progress Is Our Most Important Product

GENERAL ELECTRIC

HERE'S A BEE
FOR YOUR BONNET . . .

Suppose you owned a drilling rig...

Keeping busy doesn't always mean success for the bee — it takes a good return from the flowers to build up a reserve in the hive.

The drilling contractor too, must receive a fair return for his work. The financial reserve he builds up is used to provide the up-to-date equipment producers expect.

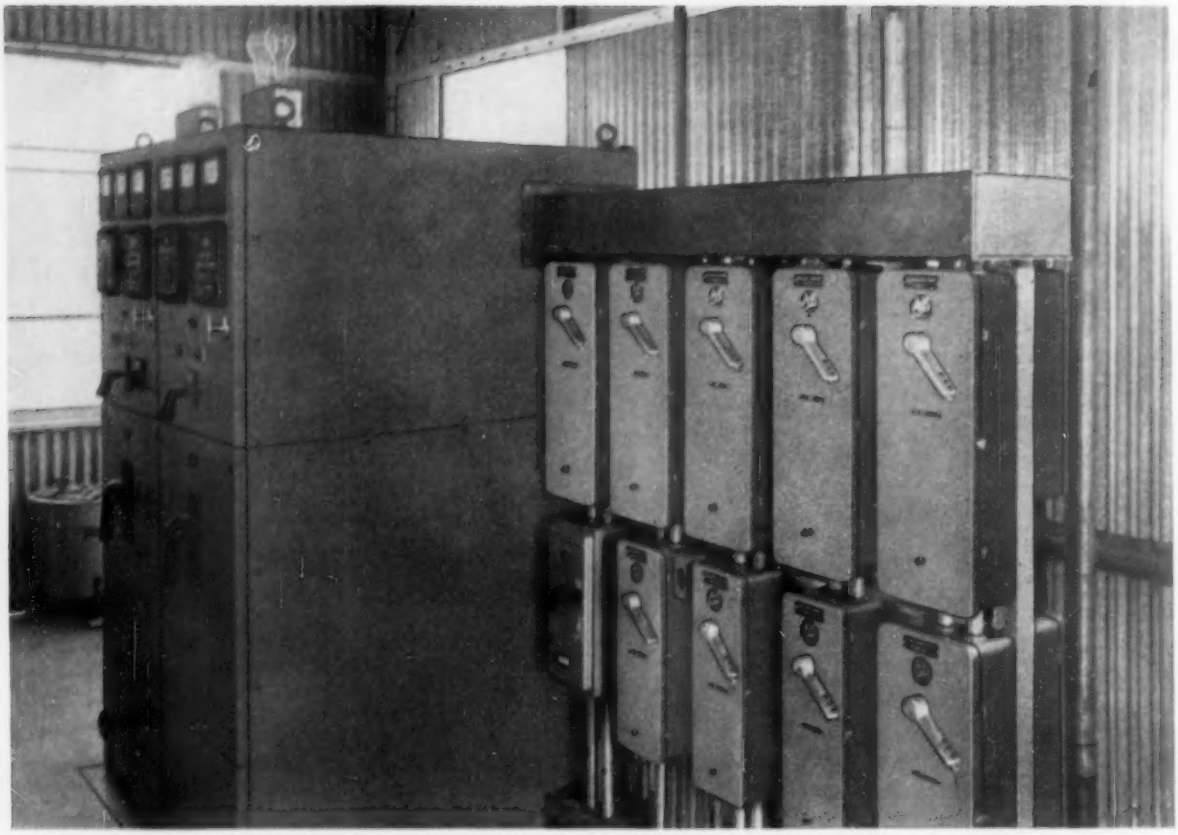
Only in this way can the producer continue to be assured of economical drilling costs.

IT'S WORTH A LOT TO THE PRODUCER FOR THE CONTRACTOR TO MAKE A REASONABLE PROFIT.

UNIT RIG

NO. ONE IN A SERIES

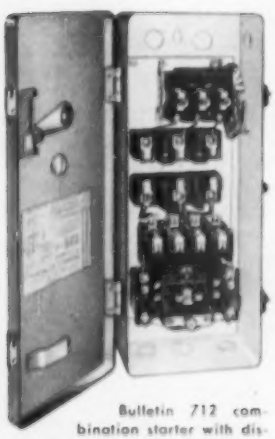
UNIT RIG & EQUIPMENT COMPANY / TULSA, OKLAHOMA



Allen-Bradley Bulletin 712 combination starters on processing pump motors in field processing plant in Trent, Texas

FOR MAXIMUM SAFETY

***use* ALLEN-BRADLEY BULLETIN 712-713 COMBINATION STARTERS**



Bulletin 712 combination starter with disconnect, fuse clips, and starter. When disconnect is "Off," open contacts are plainly visible.

You get a lot of extra PROTECTION for MAN, MOTOR, and MACHINE when you install Allen-Bradley combination starters.

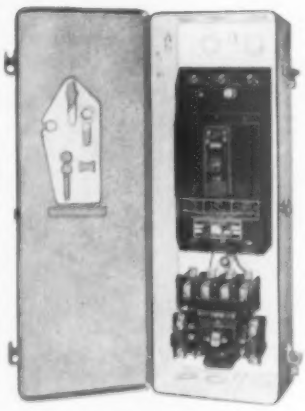
1st—The switch lever on the door of the enclosure is interlocked with the manually operated disconnect switch or circuit breaker so that your maintenance men cannot open the cabinet unless the disconnect lever is in the "OFF" position . . . when the starter is "dead" and even the line terminals of the disconnect unit are shielded against careless contact. This feature PROTECTS your electricians against the hazards of servicing "live" parts.

2nd—The solenoid starter has two accurate thermal relays that PROTECT the motor against burnouts due to overload.

3rd—Enclosures for general purpose, watertight, and explosion-proof service are available to assure "safe" operation.

Standardize on A-B combination starters . . . and enjoy maximum safety for "man, motor, and machine!"

Allen-Bradley Co., 1304 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.



Bulletin 713 combination starter with I-T-E instantaneous circuit breaker and solenoid starter in general purpose enclosure.

A-B Quality

ALLEN-BRADLEY
QUALITY

A-B Quality

HURT OIL CO., LTD.

SAN JACINTO BUILDING
HOUSTON 2

November 4, 1955

Good work, John. This is the kind of Service that has put O-C-T on top!
JM.

Mr. John Maher, President
Oil Center Tool Company
Post Office Box 3091
Houston 1, Texas

Dear John:

The assistance which your organization rendered us was a tremendous contribution in solving our problems on the Kaplan well fire.

While watching Kinley's fire fighting crew at work on Wednesday, I was especially impressed with the skill and experience of Mr. Richards and Mr. White of your organization, who were down in the pit with Kinley and his crew. They certainly know their business, and were a wonderful asset.

Also, the transportation you provided with the Twin Engine Aero Commander worked out just right, and I want to tell you how very favorably impressed I was with your fine Pilot. He couldn't have been more considerate and cooperative.

My sincere appreciation and thanks for your help.

Sincerely yours,

Harry Hurt

HH:mh

DOWELL FRACTURING UNITS FEATURE TWIN DISC TORQUE CONVERTERS

Right: One of Dowell's portable fracturing units powered by a 1500 hp aircraft engine. *Above:* Twin Disc 16,000 Series Torque Converter, through which power is transmitted from the aircraft-type engine to the pump.

There is nothing unusual about torque converters on mud pumps, but there *is* something new and different about their use on a new fleet of remote controlled fracturing units manufactured by Dowell Incorporated, Tulsa, Oklahoma.

First of all, the company ended its search for a light weight, yet high output power source to drive these portable pumps—by incorporating a line of 1500 horsepower aircraft engines. Then, to eliminate shock loads, to maintain steady pressures and to have required horsepower available to the pumps at all times, Dowell chose Twin Disc 16,000 Series Torque Converters.

Drawworks, mud pumps—whatever your power application problem is, you'll find Twin Disc Torque Converters a simple solution to cutting operating costs. The smooth, no-shock flow of power through the *fluid drive* increases machinery life, reduces engine wear and minimizes down time. Also, full engine horsepower can be maintained regardless of load . . . for greater all-around economy and efficiency.

Take advantage of the many cost-saving features offered by Twin Disc Torque Converters. For full information, call the nearest Factory Branch . . . Tulsa: 505 Enterprise Building, Sixth and Boston, Gibson 7-1578. Dallas: 1511 Turtle Creek Boulevard, Riverside 3014. Los Angeles: 2950 Leonis Boulevard, Logan 8-3309 . . . or write Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois.

TWIN DISC

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois

YOU CAN DEPEND ON YOUR BOVAIRD STORE

TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT...
AT REASONABLE
COMPETITIVE PRICES

- **Friendly Service**
- **Prompt Information**
- **Dependable Products**
- **Years of Experience**

SUPPLY BOVAIRD COMPANY

PESA

OFFICES AND STORES

COLORADO — Denver
ILLINOIS — Clay City, Grayville, Salem
KANSAS — Chase, Great Bend, Liberal, Pratt, Russell, Wichita
NEW MEXICO — Lovington
OKLAHOMA — Duncan, Oklahoma City, Pauls Valley, Pawhuska, Sapulpa, Seminole, Tulsa
TEXAS — Abilene, Borger, Dallas, Houston, Midland, Odessa, Pampa

"Buy from Bovaird"

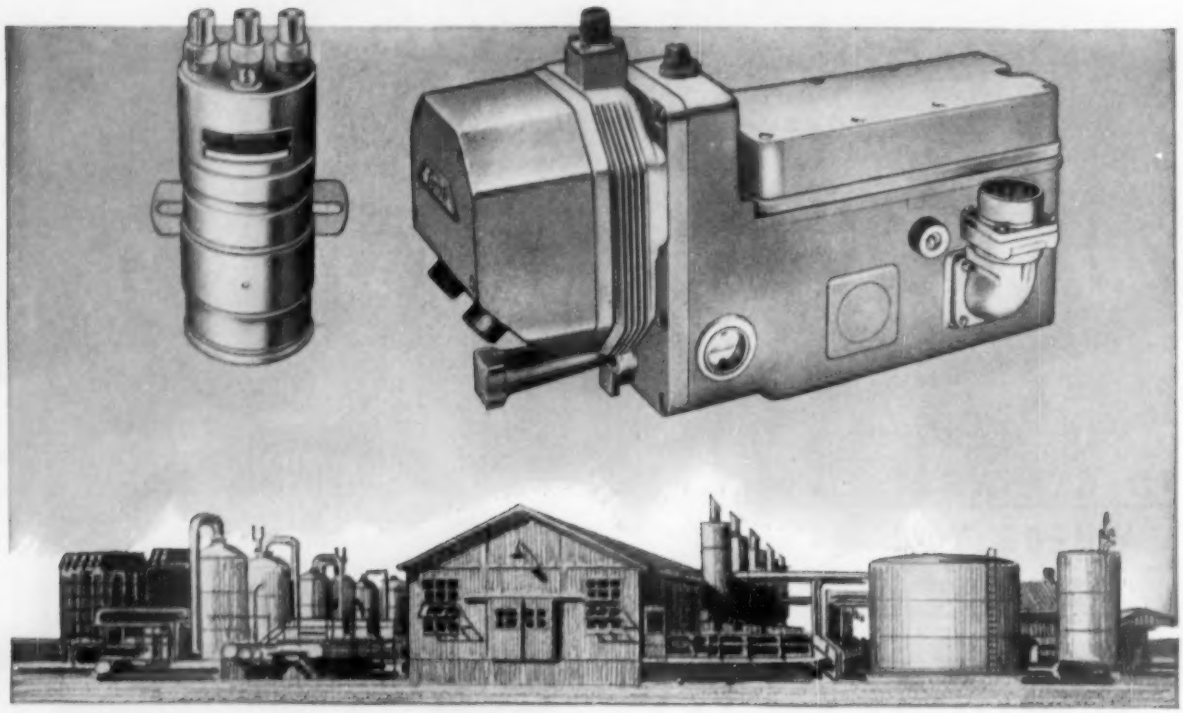
THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

85 YEARS OF PROGRESS WITH THE OIL INDUSTRY

Bendix —*the most trusted name in ignition*—

Presents a New Matched Ignition System



Designed Specifically for the Petroleum Industry

OUTSTANDING FEATURES

Long service life

No unscheduled ignition shutdowns

High voltage output

Matched ignition components

Flame proof

The Bendix* LC Magneto has been engineered to meet the exacting requirements of the modern high-compression gas engines so widely used throughout the petroleum industry.

Because the Bendix LC is a completely new type of magneto, it incorporates the latest developments in materials, engineering, design and production techniques. The result is a matched ignition system—LC Magneto plus Bendix Hi-V Transformer Coils—that delivers ample voltage with greatly reduced maintenance costs.

For engines of 6 to 16 cylinders where top performance is a must, the new Bendix LC Magneto is the logical choice.

Complete descriptive folder is available on request.

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Export Sales and Service: Bendix International Div., 205 East 42nd St., New York 17, N.Y.

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AVIATION CORPORATION

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

Expanding Station Uses . . .

PACKAGED COMPRESSORS IN 5 YEAR PROGRAM

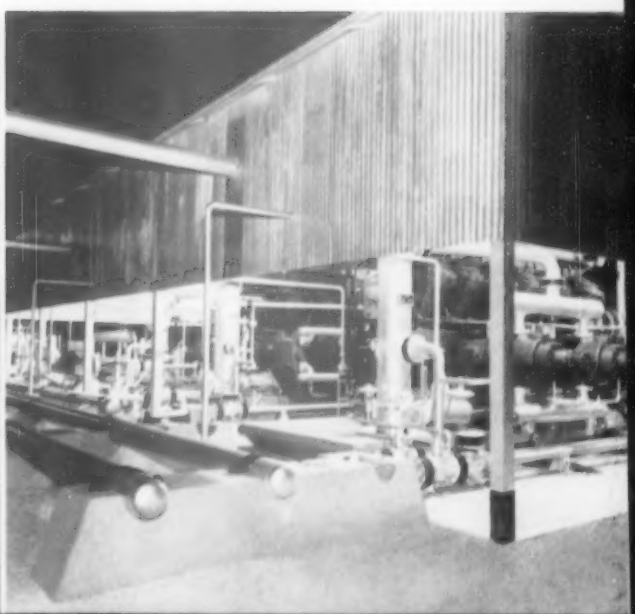
R. E. SMITH CARTHAGE FIELD COMPRESSOR STATION—equipped with three Beaird-Ingersoll-Rand gas engine driven packaged compressor plants, Young radiators and all necessary controls. Beaird packaged compressor plants are available in a range of sizes from 110 to 660 h.p.

R. E. SMITH planned his Carthage Field compressor station for economical step-by-step expansion by utilizing packaged compressors. Now boosting gas from 200 psig to 1,300 psig at the rate of 10 mmcfd, the station has grown from a single 220 h.p. Beaird-Ingersoll-Rand Compressor Plant to three units with a total of 1320 h.p. all supplied by Beaird to meet increasing needs.

Originally designed with piping and connections for additional units, the station added the second compressor, a 440 h.p. Beaird 8SVG, when new wells were tied into the station. The third, a 660 h.p. Beaird 12SVG, was installed when wellhead pressures dropped and two-stage compression became necessary. At present only the largest and one small unit are needed, but as the pressures drop still further all three will be used to follow the suction on down through final production stages.

Fully automatic and designed for unattended operation, the station has required no increase in personnel to handle the added units.

Let us show you how packaged compressors can provide the most economical means of enlarging your present compressor station.



THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

BEAIRD

MACHINING • MANUFACTURING • STEEL WAREHOUSE

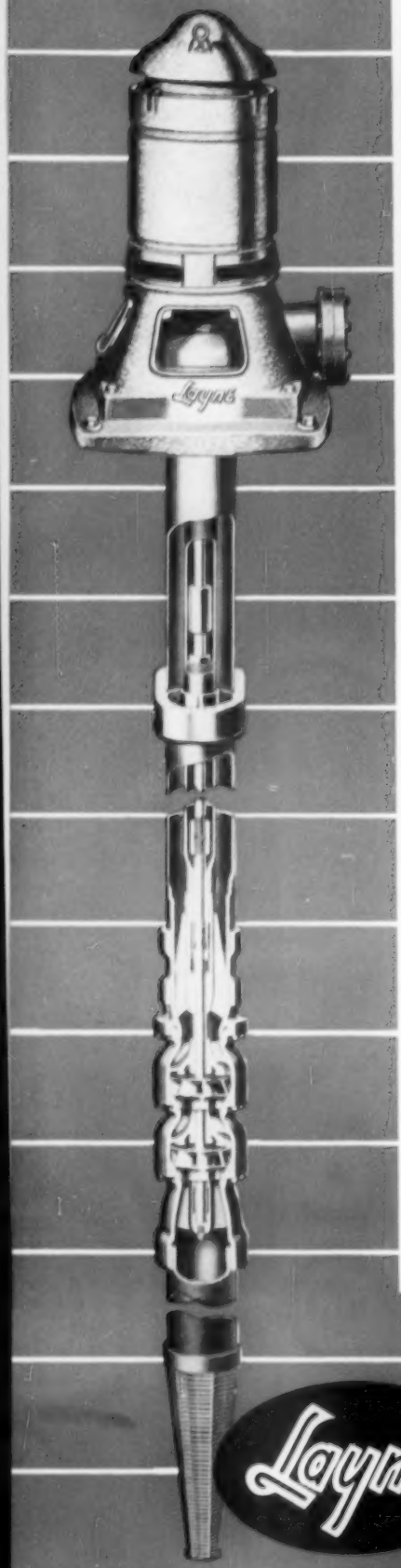
PACKAGED COMPRESSOR PLANTS

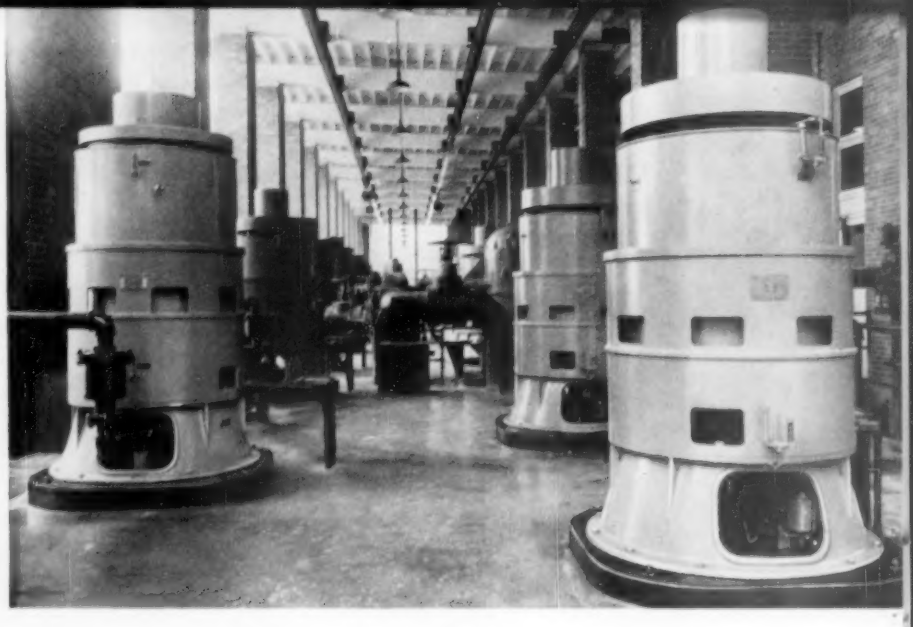
CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS





One million gallons of water ...every four minutes

The modern refinery of Cities Service Refining Corporation at Lake Charles, Louisiana, used enough water daily to supply the needs of the City of Philadelphia, Pennsylvania. Layne wells and Layne pumps provide the water used in the intricate refining processes of this giant of the petroleum industry.

Industry—to an amazing degree—relies on Layne, and that is equally true of our municipalities and agriculturists. Water, delivered where it is needed with unfailing dependability and in proper quantities, is an irreplaceable essential in our scheme of industrial production—and Layne knows most about water.

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& BOWLER, INC.
MEMPHIS
General Offices and Factory

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

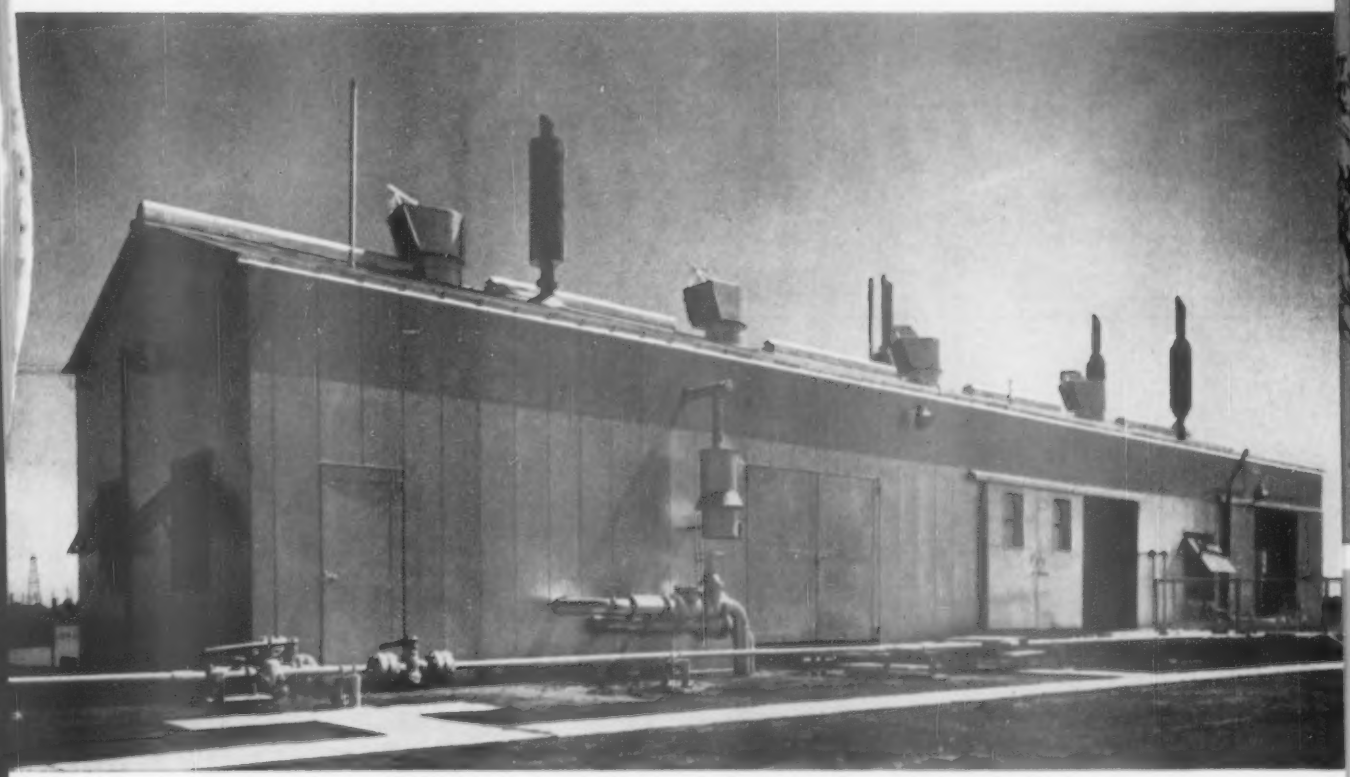
Water Wells • Vertical Turbine Pumps • Water Treatment

You're on top of the best steel building buy when you specify PARKERSBURG

When you add up the many advantages of owning Parkersburg Steel Buildings you unmistakably come to the conclusion that you are indeed on top of the best building buy in the country today. The neat, functional design, that attests to your good taste and complements either industrial or residential areas, is but the beginning.

It is from the unseen benefits that you particularly profit. Their economy begins the day you buy them — continues for years and years. They require only a minimum of maintenance.

Their enduring strength is built to take whatever the elements have to offer in any climate — on land or sea — and provide a lifetime of dependable security for whatever they house. Their unlimited flexibility affords low cost expansion by simple addition of standard units. Special fronts can be added to individualize their appearance. And should you ever need to move them you can do so with 100% salvage.



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Thanks to the spur of keen competition among our members—and their innate desire to back up their continually improved products and special services with helpful technical assistance

. . . we* give our customers outstanding service—as proved by the fact that our service cars, trucks, and pickups travel *511,000,000 service miles a year;*

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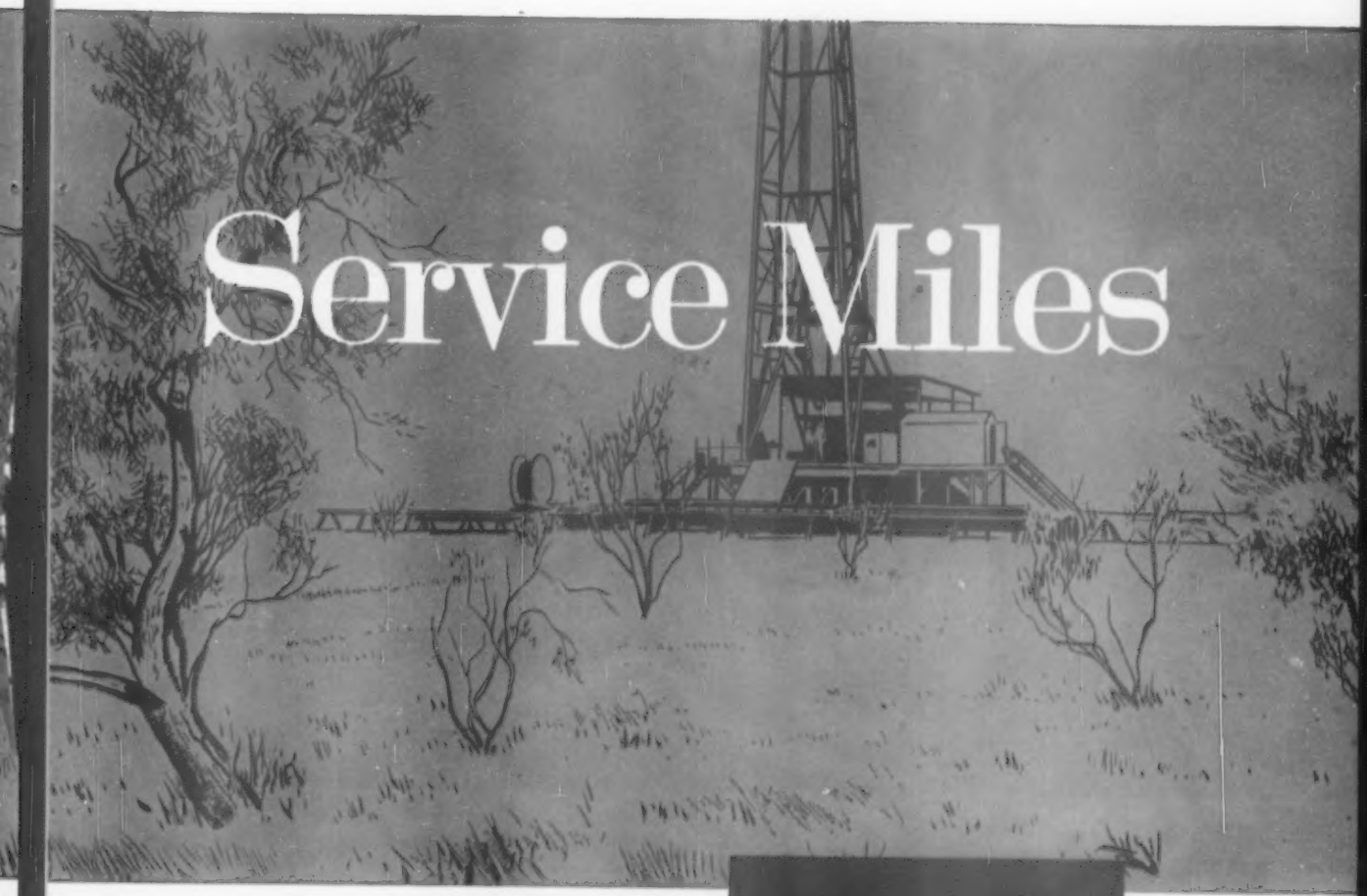
. . . we* back up our products and services with *plants and equipment worth billions of dollars* in order to supply our customers with constantly improved equipment and services in *quantities wanted . . . when wanted . . . where wanted.*

***Manufacturers . . . Supply Companies . . . Service Companies**

rdinary service



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Composed of manufacturers whose plants make the finest precision equipment . . . supply stores who add the other ingredients of value — where you want it — when you want it . . . service companies who make available to their customers the practical results of the research efforts of some of the most brilliant scientific and technical men in the world.

Where power's needed—
MACK'S GOT IT!

Macks have the muscles needed to move heavy oil field machinery and equipment, according to Glasscock-Wilson, Inc., drilling contractors of Shreveport, Louisiana.

And they should know! Their Macks have to move big loads of oil field machinery and equipment over rough, marshy terrain without miring in, and travel on highways at good speeds as well.

Thanks to Macks' combination of Thermodyne® power, heavy-duty Balanced Bogie and Power Divider, plus all their other Mack-built components, Macks can be relied upon to get the load through on schedule. As Glasscock-Wilson reports: "We find that our Mack units are highly dependable, give excellent performance, and have low over-all maintenance cost."

Here's just one more example of the way that Macks are handling the Mack-sized jobs in the petroleum industry—all the way from exploration through refined product delivery, setting records that no other make of truck can match for low-cost, profitable performance.

MACK TRUCKS Empire State Building, New York 1, N. Y.

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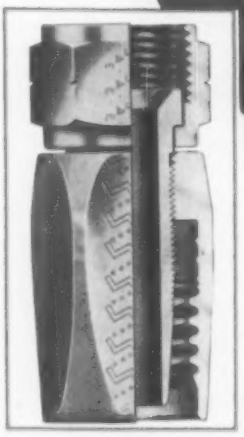
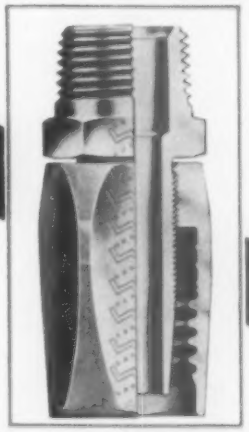
Save time-Cut costs with STRATOFLEX

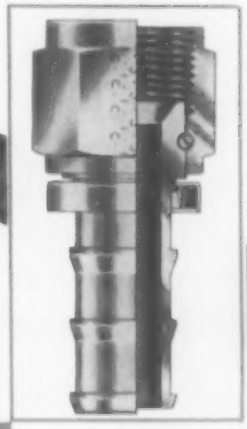
☐ FLEXIBLE HOSE
☐ REUSABLE FITTINGS



Stratoflex "over the cover" SAE Swivel Hose Fitting.

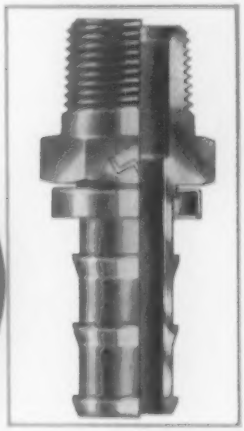


Stratoflex "over the cover" Male Pipe Hose Fitting.



Stategrip J.I.C. Swivel Hose Fitting.

Strategrip Male Pipe Hose Fitting.



- For fuel lines, oil lines, water lines, and hydraulic and air controls Stratoflex hose and fittings are unbeatable for trouble free service and economy. Hose is flexible, abrasion resistant, and light weight. Fittings provide a vibration-proof and leak-proof connection.
- Assemble your own hose lines quickly in the field or buy complete hose assemblies.
- Wide range of sizes and types for high and low pressure applications.

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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

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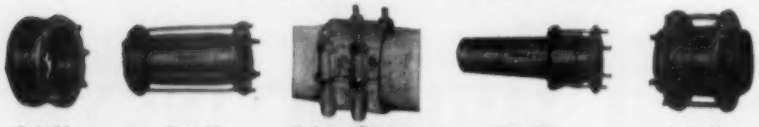
The DRESSER way is easier, safer, surer!

For all tank and equipment installations—or anywhere else you have pipes to connect—Dresser Couplings, Long Sleeves and Fittings speed joining, assure leakproof, flexible connections that last.

Installation is simple. No threading, flanging or exact pipe fitting is needed. Using only a wrench, you get quick, sure joints that absorb vibration and deflection, that can be dismantled and re-used, safely and easily, whenever necessary. Work can be done in any weather . . . with 100% tightness assured every time!

AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES



Style 38 Coupling | Style 40 Long Sleeve | Hydrepair® Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

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ONE OF THE DRESSER INDUSTRIES

They Say—

It's Straightened Out

Dear Sir:

A clerical error in the typescript of the article, "Things to Come in Oil Finding," somehow managed to escape correction and found its way to page 185 of the March 12 issue of The Oil and Gas Journal.

The statement that "new reserves discovered in 1955 were less than the amount of petroleum used in the U.S." is, of course, incorrect. Actually, new discoveries of all liquid hydrocarbons last year were considerably greater than consumption, as they have been for many years.

While this does not in any way alter our premise that the oil industry must accelerate domestic exploratory activity, we feel that the error should be brought to the attention of your readers.

Sidon Harris
President
Southern Geophysical Co.
Fort Worth.

What About Prices?

"While production and exploration costs have increased substantially since the last crude-price increase, the excess domestic producing capacity and the pressure of low priced foreign oil makes a price increase seem rather unlikely.

"Product prices generally are not as high as they should be in view of crude prices, quality improvement, and increased operating costs. However, competitive conditions are so intense in our industry that we cannot be sure of higher product prices. . . . "

Robert E. Wilson, chairman, and Frank O. Prior, president, Standard Oil Co. (Ind.) in joint statement in company's annual report.

Lean Days Ahead?

"A raw materials study which I saw recently forecast that with living standards rising, population growing, and more areas of the earth becoming industrialized, the time will come when resources used now will no longer exist.

"Our machine civilization then will have to feed 'on the leanest of substances—the rocks which make up the surface of our planet, the waters of the seas, and the gases of the atmosphere.' This will require enormous amounts of energy which the study estimated would be derived from the rays

For higher pressures
—higher temperatures

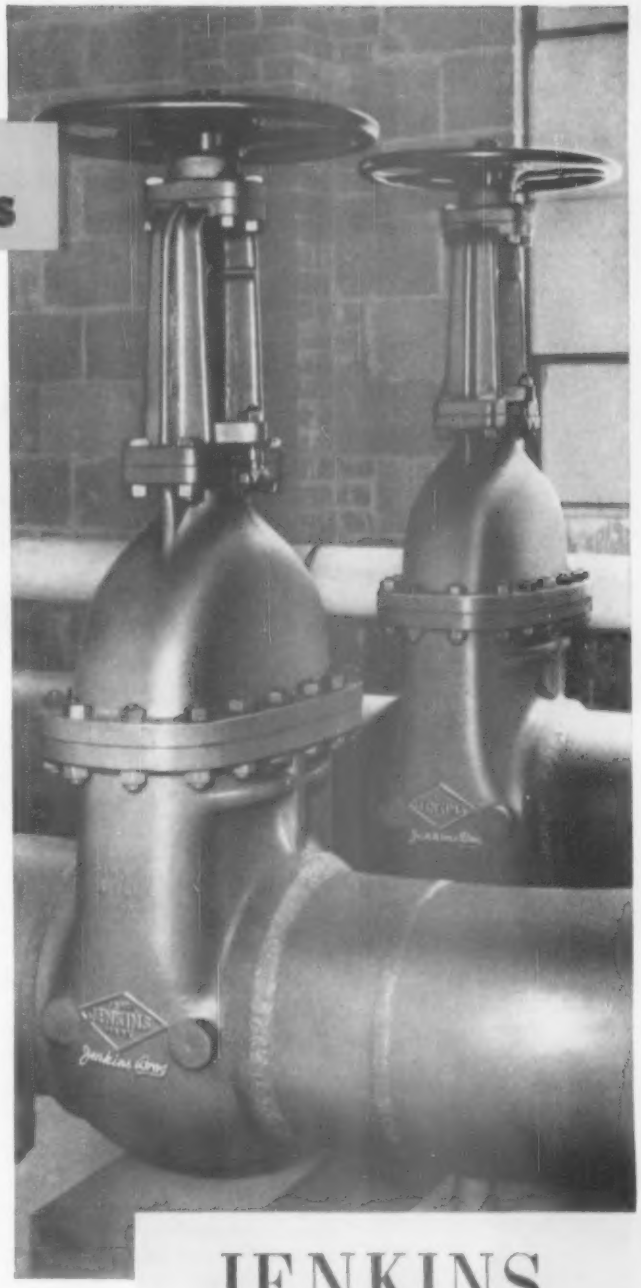
JENKINS CAST STEEL VALVES

serve the systems planned for lowest operating costs

The steadily increasing number of power generation and industrial processing installations of Jenkins Cast Steel Valves is clear evidence of economy-minded selection by valve specifiers and buyers.

Jenkins Cast Steel Valves offer any required combination of casting alloys and seating metals for any service up to 600 lbs. pressure and 1000°F. temperature. Along with specified ratings, buyers get the plus of Jenkins *extra value*, in design, in construction, in quality standards.

Test Jenkins Cast Steel Valves at the most punishing control points in your plant. Compare performance, and you'll see how they set new standards for long-range economy.



PATTERNS

Gates 2" to 24". Globes and Angles 2" to 10". Swing Checks 2" to 12". Non-return, stop and check Globes and Angles 4" to 10".
Screwed, Flanged, or Weld Ends.

PRESSURES

150 lb. — 300 lb. — 400 lb. — 600 lb.

PRESSURE CASTING ALLOYS

Carbon Steel (150 lb.)
Carbon Molybdenum Steel — 300, 400, 600 lb. Valves
Chromium Molybdenum Steel

SEATING METALS

H Monel
13% Chromium Stainless Steel
Carbon Molybdenum Steel, Stellite faced
AISI Type 316 Stainless Steel

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

FOR COMPLETE SPECIFICATIONS, GET THIS CAST STEEL VALVE CATALOG

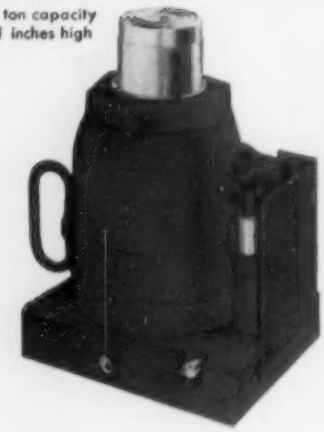
It describes all patterns, casting alloys, and seating combinations, with details of the *extra value* design and construction features. Gives pressure-temperature ratings, dimensions, and other technical data. Get a copy from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

These Modern Jacks Can Lift Heavier Loads With Less Effort!

30-H-11
30 ton capacity
11 inches high

50-H-11
50 ton capacity
11 inches high



12-H-9
12 ton capacity
9¼ inches high

3-H-9
3 ton capacity
8½ inches high

These precision built jacks require much less effort to operate than mechanical type jacks because they utilize the hydraulic principle—a pump does the work.

Duff-Norton Hy-Power Hydraulic Jacks, because of this ease of operation, are finding more widespread use in the oil fields for all kinds of heavy lifting and pushing jobs. They are standard equipment on many rig builders' trucks and on drilling rigs.

There are ten Duff-Norton Hydraulic Jacks with capacities from 3 to 50 tons. All models can be equipped with gauges calibrated to show exact weight of load being lifted.

See these time and energy saving hydraulic jacks at your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks for complete specifications. Ask for Hy-Power Hydraulic Jack Bulletin AD16-B, Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON *Jacks*

"Giving Industry A Lift Since 1883"

of the sun, atomic energy provided by the uranium and thorium of rocks, and conceivably by controlled thermonuclear reactions utilizing deuterium extracted from the oceans."

Samuel Lenher, vice president, E. I. DuPont de Nemours & Co., in address before National Science Teachers Association, Washington, D.C.

Won't Help Anyone

"I do not see how divorcement (of marketing from other operations of integrated oil companies) can help anybody in the oil industry or any customer of the industry.

"I can see how it might hurt many. There are reasons to believe it would mean the end of many jobbers and dealers. It could lead to poorer service to the public."

J. B. Jordan, vice president for marketing, Shell Oil Co., in address to Illinois Jobbers Association, Chicago.

Here's How It's Done

Dear Sir:

Today the new issue of your magazine (Refining issue, March 19) arrived here and was received with great acclaim. Your explanation flow sheets of units able to produce 100-octane gasoline were excellent.

I have only seen the office copy which is shared by four of us. Would it be possible to purchase a single copy of this issue?

I also have my eye on your chart entitled higher octane motor fuels which gives me another reason to get a copy for myself.

Joseph A. Dunphy, Jr.,
Tide Water Associated Oil Co.
Avon Refinery
Associated, Calif.

Editor's note: Single copies of The Oil and Gas Journal may be obtained by order from Circulation Department, The Oil and Gas Journal, 211 South Cheyenne Street, Tulsa, Okla. Price of special issues is $1 and regular issues 50 cents. A special reprint of the process section of the refining issue plus the chart also are available for $1.

CALENDAR OF EVENTS

APRIL

11-13 Natural Gasoline Association of America, Texas Hotel, Fort Worth.

14-15 Southern Gas Association, conference on use of electronic computers by engineering personnel, Hilton Hotel, El Paso.

15-17 Texas Independent Producers and Royalty Owners Association, Statler Hilton Hotel, Dallas.

16-18 American Society of Mechanical Engineers, first Gas Turbine Power Conference, Hotel Statler, New York.

17 American Institute of Chemical Engineers, Philadelphia-Wilmington section —University of Pennsylvania, fourth annual meeting of "Experience in Industry" series.

17-18 Southern California Oil Industry Safety Conference, Long Beach.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

18-20 American Petroleum Institute, Division of Production, Rocky Mountain District meeting, Cosmopolitan Hotel, Denver.

18-20 National Petroleum Association, semiannual meeting, Cleveland Hotel, Cleveland, Ohio.

19-20 Third Annual West Texas Oil Lifting Short Course, Texas Technological College, Lubbock, Tex.

23-25 Southern Gas Association convention, Dallas.

23-26 American Association of Petroleum Geologists and Society of Economic Paleontologists, annual meeting, Conrad Hilton Hotel, Chicago.

24-25 Pacific Coast Gas Association, Supply and transmission conference, Thunderbird Hotel, Las Vegas, Nev.

25-27 American Petroleum Institute, Division of Production, Eastern District meeting, Deshler-Hilton Hotel, Columbus, Ohio.

25-29 World Oil Exposition, Houston.

26 Panhandle Producers and Royalty Owners Association, annual meeting, Herring Hotel, Amarillo.

26-27 Eleventh Annual Management Engineering Conference, sponsored jointly by Society for Advancement of Management and management division, American Society of Mechanical Engineers, Hotel Statler, New York.

26-27 Rocky Mountain Oil and Gas Association, refining committee, ninth annual meeting, Newhouse Hotel, Salt Lake City.

29-May 1 Pennsylvania Petroleum Association, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

30-May 1 Independent Petroleum Association of America, semiannual meeting, Statler Hotel, Los Angeles.

30-May 2 American Geophysical Union, thirty-seventh annual meeting, Washington.

30-May 5 International Course on Atomic Energy, sponsored by National Industrial Conference Board, Westchester Country Club, New York.

MAY

1-3 Petroleum Industry Electrical Association, annual meeting, Statler-Hilton Hotel, Dallas.

6-9 American Institute of Chemical Engineers, Roosevelt Hotel, New Orleans.

7-8 Gas Compressors Institute session, sponsored by University of Kansas and Southwest Kansas petroleum industry, Liberal, Kans.

7-11 American Welding Society, annual spring meeting, Hotel Statler, Buffalo.

9-10 Symposium on control of corrosion in the chemical industry, University of Buffalo.

9-10 National Association of Corrosion

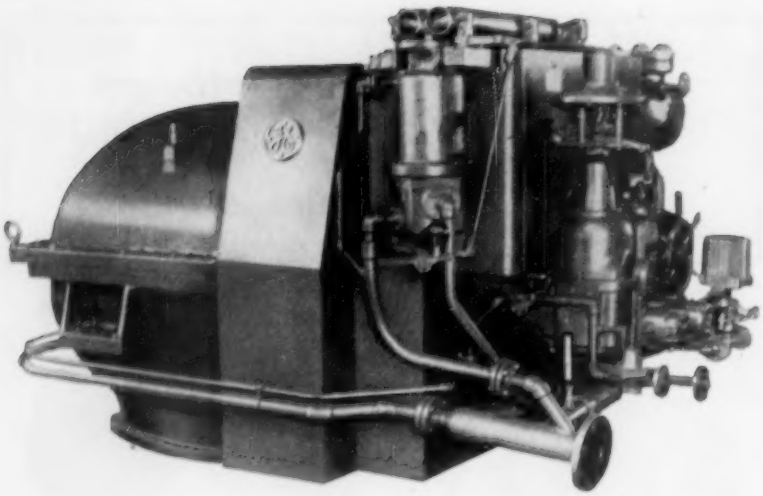
This hoist is the most efficient lightest, safest hoist in its capacity class available today!

The Coffing Super Power

It's an exclusive Coffing-designed coil chain hoist using patented, compound hardened alloy steel levers instead of bulky, heavy gears. It's more efficient (85%), more compact, with the greatest power-to-weight ratio and the highest safety factor (5) of any ratchet lever hoist yet invented. Available in 6 models from ¾ to 5 ton capacities. Model RG coil chain hoist available in ¾ ton.

"Safety valve handle" bends at point of maximum safe overload—may be adjusted for length and operated from either side of the hoist—can't spin out of control should operator's hand slip from handle. Every hoist must withstand the shock of its capacity load dropped in increments of 1" thru 4", an impact load of well over 5 to 1. Ask your Coffing salesman for literature or write for bulletin SP, Coffing Hoist Division, Duff-Norton Co., 806 Walter Street, Danville, Ill.

COFFING HOISTS



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EXCHANGER

equal efficient, high-speed operation

This General Electric high-speed Turbine is used to drive modern compressors and blowers at 7000 rpm and up. At such speeds, thorough lubrication is obviously needed.

Factory-installed by G-E, a Ross Exchanger keeps lube oil temperature within recommended limits. As a result, gears and bearings always receive sufficient lubrication at the correct viscosity.

Rugged, dependable Ross Exchangers are components of numerous makes of turbines. In fact, they are used throughout the chemical and refining industries to control oil temperatures for engines, speed increasers, compressors, torque converters and many other types of major equipment.

Combining high thermal efficiency and extreme ruggedness, pre-engineered and fully standardized Ross Exchangers are available in a wide range of sizes to meet most requirements.

For complete detailed information, request Bulletins 1.1K5 and 2.1K5.

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ROSS HEAT EXCHANGER DIVISION
of
American-Standard
1417 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

Engineers, Niagara frontier section, symposium on control of corrosion in the chemical industry, University of Buffalo.

10-11 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-11 American Gas Association, Gas Supply, Transmission, and Storage Conference, Conrad Hilton Hotel, Chicago.

13-15 Empire State Petroleum Association, Statler Hotel, Buffalo.

13-16 American Petroleum Institute, annual pipeline conference, Shamrock Hilton Hotel, Houston.

14-15 American Institute of Mining, Metallurgical & Petroleum Engineers, Kansas regional meeting, Broadview Hotel, Wichita.

14-16 American Petroleum Institute, annual pipeline conference, Shamrock Hotel, Houston.

14-16 Petroleum Electric Power Association, eighth annual convention, Robert Driscoll Hotel, Corpus Christi.

14-17 American Petroleum Institute, Division of Refining, midyear meeting, Montreal.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla.

16-18 American Gas Association, Chemical, Engineering, and Manufactured Gas Production Conference, Benjamin Franklin Hotel, Philadelphia.

17-18 Rocky Mountain Petroleum Sections, American Institute of Mining, Metallurgical & Petroleum Engineers, Gladstone Hotel, Casper, Wyo.

22-24 Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Pa.

24-25 Natural Gas and Petroleum Association of Canada, Sheraton Brock Hotel, Niagara Falls, Ont.

24-25 Western Petroleum Refiners Association, Michigan Regional Meeting, (location to be announced).

24-25 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.

28-30 Chemical Institute of Canada, 39th annual conference and exhibition, Sheraton-Mount Royal Hotel, Montreal.

30-June 1 Texas College of Arts & Industries, eleventh annual short course in Gas Technology, Kingsville, Tex.

30-June 2 Interstate Oil Compact Commission, Dallas.

JUNE

3-8 Society of Automotive Engineers, summer meeting, Chalfonte Haddon Hotel, Altantic City, N. J.

6-8 American Society for Quality Control, tenth annual convention, Palais du Commerce, Montreal.

10-15 American Petroleum Institute, Production Division midyear standardization conference, Brown Palace and Cosmopolitan Hotels, Denver.

11-15 American Institute for the Advancement of Science, Gordon Research on Conference on Catalysis and Petroleum, Colby Junior College, New London, N. H.

13 Pennsylvania Grade Crude Association, thirty-third annual meeting, Bradford, Pa.

17-22 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Atlantic City, N. J.

17-23 World Power Conference, Vienna.

21-22 Western Petroleum Refiners Association, regional technical—industrial re-

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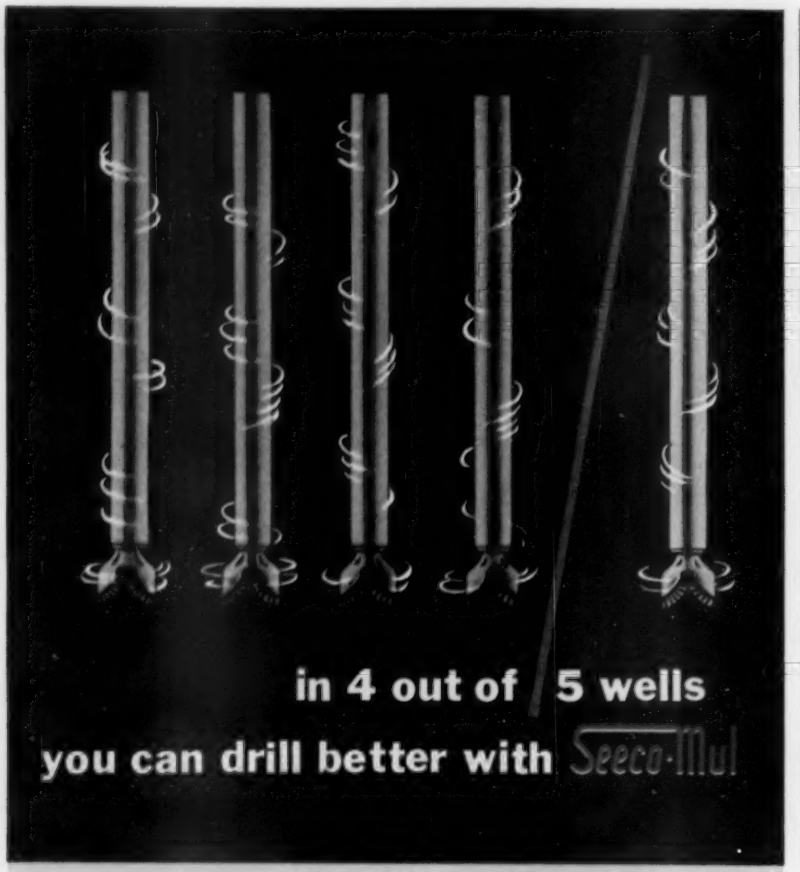

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21-23 American Association of Petroleum Landmen, annual convention, Denver.

24-25 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que.

26-29 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que. (see book).

28-30 Rocky Mountain Oil and Gas Association, board of directors, Hotel Utah, Salt Lake City.

AUGUST

2-4 Rocky Mountain Mineral Law Foundation, Second Annual Institute, University of Colorado, Boulder.

SEPTEMBER

11-13 Pacific Coast Gas Association, annual meeting, Coronado, Calif.

13-15 Chemical Institute of Canada, third Western Regional Conference, Edmonton, Alta.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York City.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

23-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Statler-Hilton, Dallas.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

OCTOBER

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

29-Nov. 1 Society of Exploration Geophysicists, national convention, New Orleans.

NOVEMBER

7-8 Philadelphia section, Instrument Society of America, Symposium on Process Data Logging, Stratford Hotel, Philadelphia.

12-15 American Petroleum Institute, annual convention, Conrad Hilton Hotel, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

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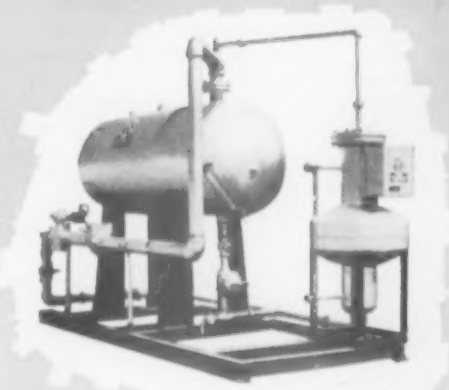

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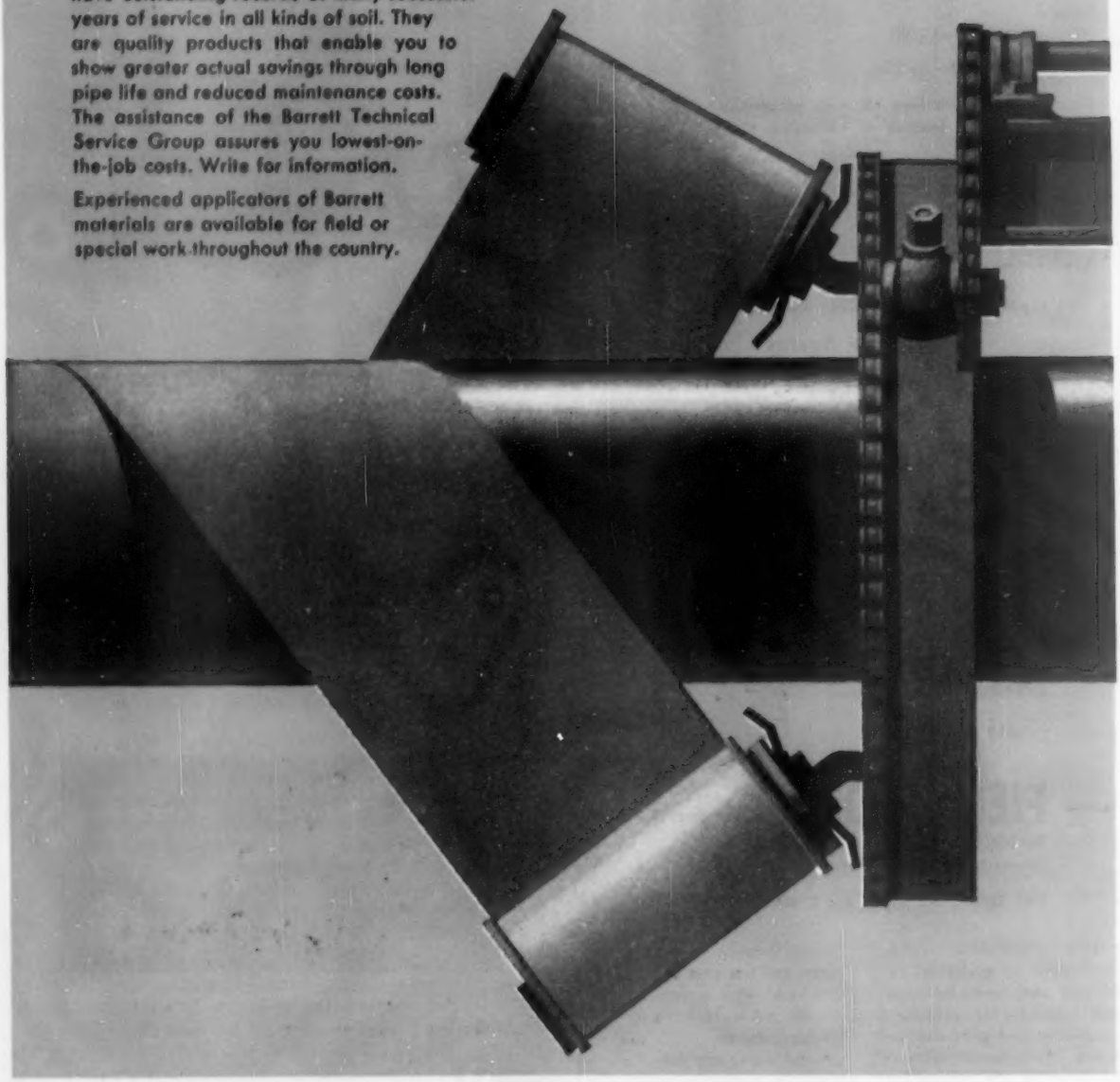

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JOURNALLY SPEAKING . . .

Party Line

WE'VE just read a story that illustrates why people out in the oil country think that oil men are pretty good folks—in contrast to the opinion that seems to prevail in some areas that the oil and gas industry is made up exclusively of filthy-rich, arrogant oil barons and grasping, soulless corporations.

It also illustrates why this fast-moving industry doesn't want to be hamstrung by government regulation and how it can cut through red tape in emergencies.

The story is in the monthly Review of the National Municipal League, and it's about the 1954 drought in two oil towns in South Central Kansas—El Dorado and Augusta. Both towns' reservoirs had been low for months, and when the expected spring rains passed them by they were desperate. Water was severely rationed, but it looked as though water-using industries would have to shut down.

Then oil men came to the rescue. The head of the Skelly refinery in El Dorado suggested that the city build a pipeline from the Arkansas River, 32 miles away. But the city had neither the money nor the legal authority, and it might take a year or more to get them.

So Skelly brought in the small El Reco refinery in El Dorado and the big Socony refinery in Augusta, 12 miles away. The two rival towns and the three competing oil companies teamed up. They short-circuited their lawyers and pooled their technical manpower. They tested the water, optioned a pump site, designed a line. They got the Santa Fe Railroad to let the line go on its right-of-way, saving months of right-of-way negotiations.

The refineries agreed to pay two-thirds of the cost, on the basis of the water they would use. But the cities had to have special bond elections, and the law specified 3 weeks' notice. Meanwhile Skelly ordered pipe, Socony bought and tested the pumps, El Reco arranged for electric power. The Oil Workers Union unlimbered its political machinery and plugged the bonds so hard that both elections carried overwhelmingly.

Lawyers ruled that the cities had no authority to cooperate this way, so the five parties agreed that each would own a certain section of the line outright.

Another obstacle was that the state's Water Resources Board had to approve the plans after the bond elections. The votes were counted on a Friday night. Board officials, who had been given all the plans in advance, were taken over the site during the week end. By Monday noon all contracts were signed and dirt was moving.

The three oil companies had already assembled supplies and equipment along the route, and construction crews were ready to start. At their request, other oil companies in other states sent experts to supervise the project and loaned equipment and materials that couldn't be purchased quickly. Socony imported an engineer to train pumping crews to operate the line when completed.

While this was going on, other oil companies in the vicinity pitched in to provide emergency water supplies. Cities Service and Magnolia, for example, drilled water wells in their oil fields and laid temporary pipes to serve nearby areas.

Water began flowing through the new line exactly 3 months after the project had first been conceived. Neither town could have lasted a week longer without it.

That was a year and a half ago. But normal rains still haven't come to Kansas, and all last summer, when most of the state was a sickening brown, lawns and trees in El Dorado and Augusta were green and the industries there never lost a day for lack of water. This summer it looks as though both towns will again owe their life to this project—a project which didn't require a cent of state or federal aid but which came into being almost overnight because of oil men's ingenuity, quick action, and cooperative spirit.

The El Dorado-Augusta story is dramatic, but it's not unusual. It's typical of the many ways in which oil companies are good citizens and good neighbors. We're glad that the Municipal League is telling it to officials of cities where oil men aren't so well known.

—*Henry D. Ralph.*

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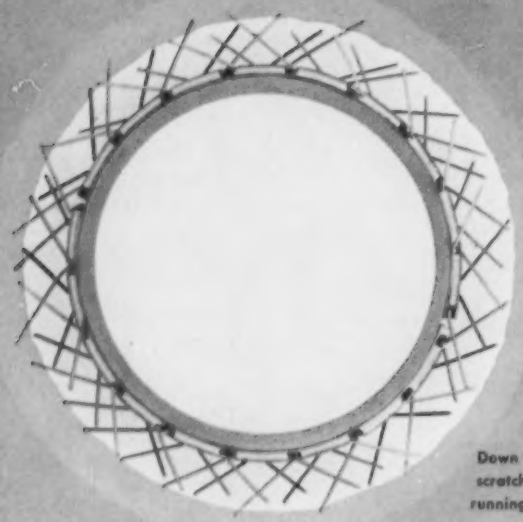

Down view shows scratcher wires in running-in position.

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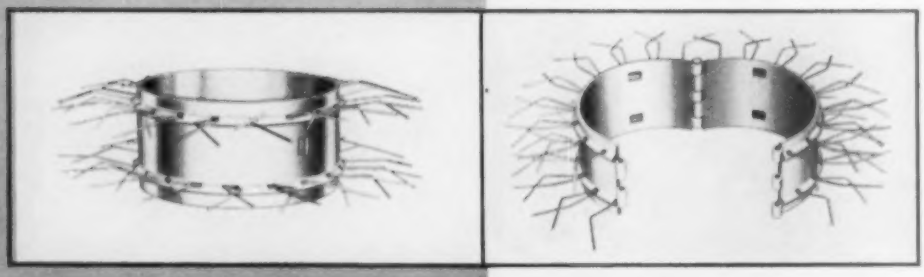

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Imports are too high if they hamper conservation

SOME critics of oil imports are now saying that the present high level of imports is crowding out conservation practices, stripper wells, and secondary-recovery operations.

The basis for this is a situation in Texas, Oklahoma, and other prorating states during the past year or so. When output is curtailed to fit market demand, the cut falls chiefly or entirely on big wells and flush production, often designated as allocated wells.

Every state has a variety of exemptions from proration, including such conditions as water floods, gas injection, stripper fields, and wells that are marginal because of sanding problems, high water-oil ratios, very small capacity, or other factors. The avowed purpose of all these exemptions is to promote conservation by preventing underground waste and reservoir damage, forestalling premature abandonment, encouraging secondary-production methods, and obtaining maximum ultimate recovery.

CONSERVATION PRACTICES have made such strides in recent years that exempt wells now produce a substantial portion of the nation's oil—nearly one-third in Texas, about one-half in Oklahoma, for example. At the same time our producing capacity has been above the demand for domestic crude, so prorated wells have had rather low allowables in some states.

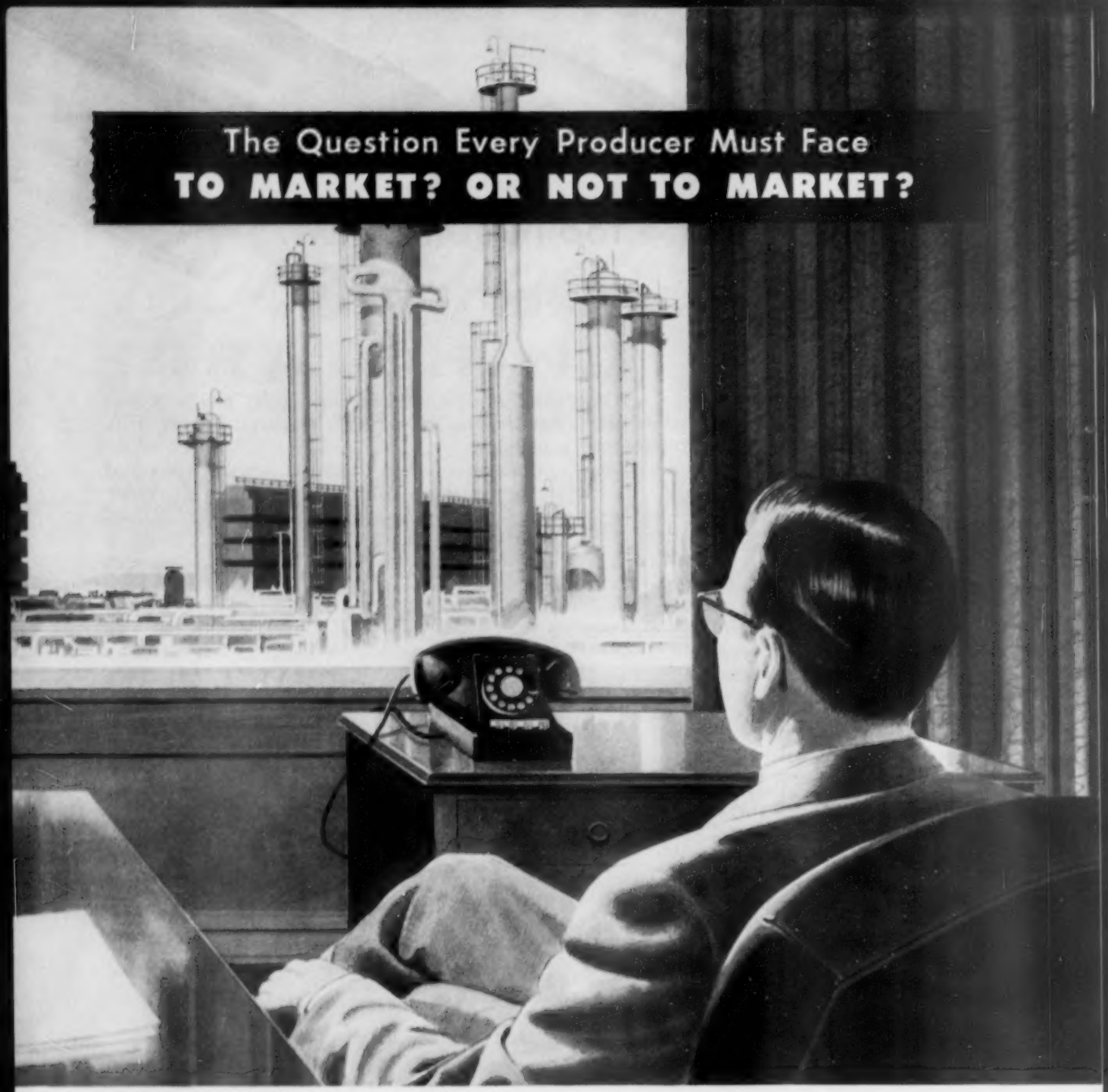
Many prorated producers are now asking that heretofore-exempt wells also be subject to some curtailment when market demand is below the maximum efficient rate of production. They allege inequities and fallacies in the exemptions, saying, for instance, that many water floods can be produced below their MER without injury to the reservoir or loss of ultimate recovery.

The Texas Railroad Commission is currently making a survey of its exemptions from market-demand proration to see whether or not such wells could be prorated without damage or loss. Other states face a similar problem. The answer probably lies in engineering data on each field.

Some perfecting amendments may be needed in individual state proration systems, but the fact remains that the basic thesis of all the exemptions is to promote conservation. If this purpose is being achieved it is a consideration so vital to the national interest that it should not be hampered by excessive production within this country nor by excessive imports.

THE ARGUMENT OVER IMPORTS has centered around what level is best for the national interest, all things considered.

If evidence develops that the current rate of imports actually is interfering with sound conservation practices, then all other imports arguments, pro and con, should take second place to this consideration.



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Current and significant in . . .

The Industry This Week

Industry

• **Canadian operators** are facing a critical problem. They must find markets for their rapidly expanding production. Two actions are possible: Expand present pipeline facilities to replace imports with domestic crude and expand exports to the United States. P. 64.

Union Oil is selling $120 million worth of its debentures to Gulf, which can convert them within 15 years to 2.4 million shares of Union stock. Union says it's not a merger, merely a deal to give Union funds for expansion and access to much needed oil. For Gulf, it's an investment in the West. P. 67.

Exploration

• **Operators have found the deep zone dry** at the world's deepest hole. Richardson & Bass found salt water from perforations at 21,533-21,622 ft. in the South Louisiana wildcat. Workers are preparing to cement off the zone. No decision has been made on testing other zones below 19,000 ft. P. 71.

Three Tulsa companies have a 20 per cent interest with Gulf Oil Corp. in that new Bolivian oil concession. P. 83.

Development drilling has joined two large pools into one of the biggest Ellenburger fields. The two fields joined are Triple N and Emma in southern Andrews County. P. 75.

Pipelining

• **Colorado Interstate is seeking** FPC approval for a big-inch line from Colorado to Nebraska which may be the key to bringing Rocky Mountain gas into the Chicago area. It involves a $116-million construction program. Meanwhile in the battle for the Chicago market, Midwestern Gas Transmission says it has a 7-cent price edge over the Colorado Interstate-Natural Gas Pipeline Co. combine. P. 68.

A new products pipeline which follows an old Spanish mule trail through the mountains is now servicing the rich Cauca Valley of Colombia. The construction job proved one of the industry's most difficult. P. 84.

New outlet for 383 billion cubic feet of shut-in natural-gas reserves in Alberta is provided in a new contract signed by five producers with Saskatchewan Power Corp. P. 74.

Refining

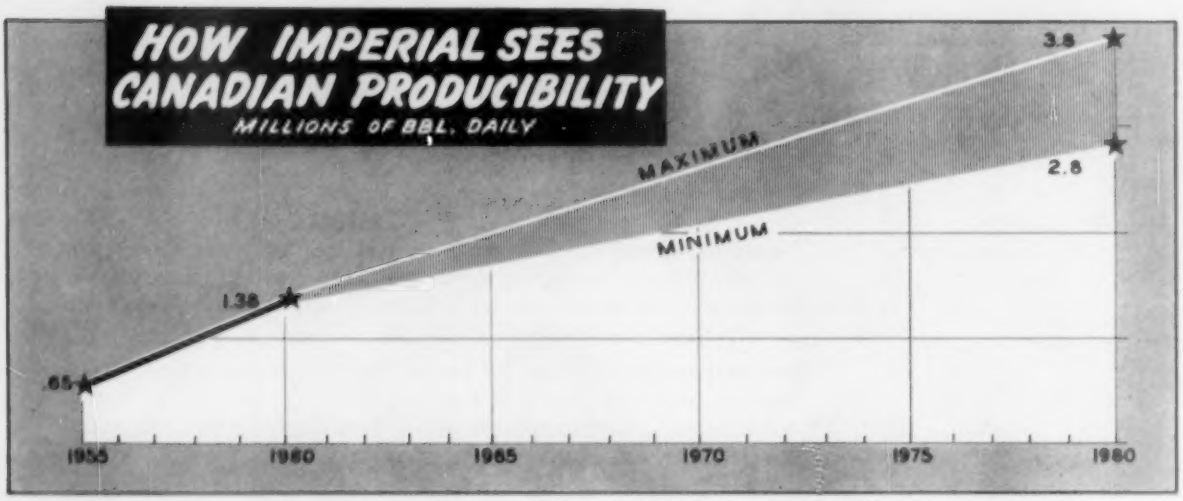
• **Esso Research & Engineering** is stepping up its atomic refining experiments. It has outgrown present sources of nuclear energy and has contracted to use the reactor of Battelle Memorial Institute in an expanded research program. This may mean Esso is on the trail of big things in processing with atomic energy. P. 72.

Sun Oil apparently likes the way its novel five-grade gasoline-marketing experiment is working in the Orlando area. It now plans to expand the plan throughout Florida. P. 74.

Production

• **A tough decision** is faced by the Texas Railroad Commission in regulating Goldsmith field. At issue is whether there can be two maximum efficient rates of production for one reservoir. Gulf says an increased MER is needed for the unitized part of the field if it isn't to lose oil to the nonunitized area. P. 76.

Proration of water floods may or may not be harmful. It depends on several factors, the Wichita A.P.I. meeting was told last week. It's reported reducing the input rate is more damaging than cutting production. P. 79.



New Outlets a Must for Canada

C. O. Willson

THE expanding Canadian oil industry is approaching a crossroads. To continue growing, it must become an aggressive salesman. Failure to find markets for its rapidly increasing production may mean stagnation.

Analysts now are saying flatly the 8-year policy of following the "line of least resistance" in seeking new oil markets will no longer suffice. Production from Canada's existing and new oil fields is too far outstripping domestic demand.

Several other factors are pushing Canadian crude toward world markets. Canadian operators, who already have a crude-price disadvantage to absorb, also are faced with:

. . . **Lower and lower allowables** per well unless they find new trade channels.

. . . **Mounting production costs** which, contrary to reports, have never been low.

. . . **Major expenditures** in exploration programs with prospects dimmer for fast payout.

. . . **Substantial proved reserves** still rapidly developing but at high lease and drilling costs. This particularly is a problem for United States companies who have Canadian production without markets of their own in the dominion.

What's answer? . . . Most oil men in western Canada agree the time has come when more outlets are mandatory—even if someone has to move over in existing world markets.

These observers say the immediate solution lies in two directions:

. . . **Pipeline expansion** of present facilities to supplant Canadian imports with domestic supplies.

. . . **Increase oil exports** to the United States or a combination of both.

The challenge to operators on both sides of the border is to make room for Canadian oil without disturbing existing price relationships and the needed higher posted price schedules. This is of international significance and of special importance to oil operations in the Western Hemisphere.

Spark for fire . . . The reason for this changed attitude toward aggressive marketing lies in the constant revisions upward of reserve estimates for the western provinces.

A year ago the accepted projection called for a million barrels daily of available output not earlier than 1960. Now that date has been changed to 1958, and the 1960 figure has been upped to a minimum of 1,300,000 bbl. daily. In the meanwhile, entirely new discoveries from widespread wildcatting could further expand the 5-year prediction.

While operators are concerned primarily with immediate problems in supply and demand, more consideration is being given to probable Canadian operations 15 to 25 years from now. In this connection, the larger Canadian oil companies have submitted oil and natural-gas data to the Royal Commission on Canada's Economic Prospects extending to 1980.

This investigation, which has been compared to the U. S. Paley report, will be completed and conclusions drawn before the end of the year covering all phases of Canada's economy for a 25-year period. A more definite policy regarding the government's future position, relative to the dominion's oil and natural-gas development is expected to be one of the results.

This discussion is primarily concerned with the period through 1960. But the longer projection of Imperial Oil, Ltd., does have some bearing on current planning.

The Imperial analysis says that the 3 billion barrels of proved reserves in Canada at the start of this year will jump to 6.6 billion barrels by 1960. It will go to 13.3 to 17 billion barrels by 1980. Present producibility of around 650,000 bbl. daily will increase to 1,380,000 bbl. daily in 1960 and to 2,800,000 to 3,800,000 bbl. daily in 1980.

Most exploration men agree that Imperial's projection through the 25 years is probably more conservative than those for the United States for the comparable period. As explained in the Imperial testimony, the Western Canadian Basin, including Northwest Territories, covers 770,000 sq. miles. To the end of 1954 only one exploration well had been drilled to each 151 sq. miles. This compares with one well per 12 sq. miles in the United States.

Current situation . . . This is the statistical position of the Canadian oil industry:

Crude-oil production, practically all of which is in western Canada, is 440,000 bbl. daily. This includes a stable production of 1,500 bbl. in the eastern provinces and about 2,000 bbl., seasonally adjusted, in the Northwest Territory.

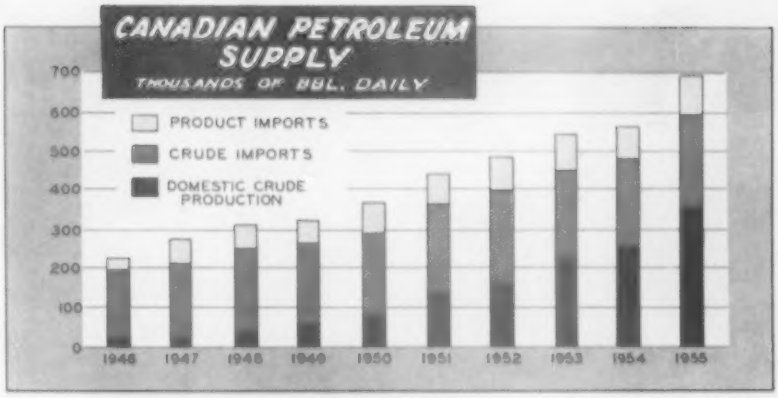
No recent import figures are available, but they are estimated for early

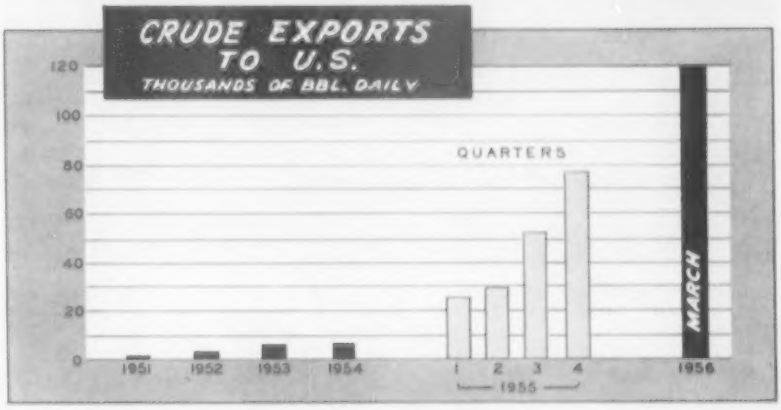
1956 to average 250,000 bbl. daily of crude oil and 105,000 bbl. daily in products.

The crude-oil imports to the two refineries in the Toronto area are expected to average 20,000 bbl. daily. A Sarnia, Ont., refinery will be operated with 10,000 to 12,000 bbl. daily of Texas crude oil. The remaining imports are accounted for by a refinery in British Columbia, the Maritime Provinces and by a group of plants in Montreal, the largest refining center of the dominion.

Exclusive of the United States, the bulk of the imported crude oil comes from Venezuela and smaller quantities from the Middle East.

On the demand side, all of the supply is consumed within Canada except about 115,000 bbl. daily of crude oil exported to the United States. These exports include 65,000 bbl. daily to two refineries in Washington, 44,000 bbl. daily to four refineries in Minnesota and Wisconsin, and 6,000 bbl. daily to three refineries in Michigan.





Canadian demands . . . An average of the estimates of Canadian petroleum demands this year is around 660,000 bbl. daily.

Yearly percentage gains in Canadian oil consumption have exceeded those of the United States since the close of World War II.

In refining, Canada had 41 operating refineries January 1 with a crude-oil capacity of 680,645 bbl. daily. This is approximately 20 per cent greater than current crude runs to stills. More capacity will be added before the end of the year *(The Oil and Gas Journal, March 19, 1956, page 243).*

Thus, briefly summarized, Canada has 795,000 bbl. daily of petroleum supply—55 per cent from domestic production, 32 per cent from imported crude, and 13 per cent from imported products. Assuming no more than seasonal changes in inventories, 85 per cent of the supply is consumed within Canada and 15 per cent is exported to the United States.

The problem . . . The outlook is for only slightly greater domestic demand but a big jump in supply.

If the present relationship of imports to total supplies remains unchanged, the best that can be expected in new markets for Canadian crude oil within the dominion will be 75,000 bbl. daily by 1958 and 120,000 bbl. daily by 1960.

At the same time, availability of crude supply in western Canada is expected to increase 350,000 bbl. daily by 1958 over the present figures of 650,000 bbl. daily and climb at least to 1,300,000 bbl. by 1960.

Thus the problem is this: Find outlets for available production which will increase at a yearly rate exceeding 100,000 bbl. daily.

Defense policy . . . Any solution to finding more outlets for this Canadian oil will be influenced by the public policy of both Canada and the United States.

It is no secret that in the defense planning of both countries their oil operations are now completely integrated. The U. S. Department of Defense feels that the discovery of Leduc field, Alberta, in 1947—the start of the rapid expansion in Canada's petroleum—was one of the biggest "breaks" in its overall planning. Without it, the defense program for both countries would be substantially different from what it is, involving controls in domestic operations not now necessary.

In furtherance of this emergency end, Washington will welcome developments that will extend peace-time integration of the two countries' oil operations provided there is no serious disruption of the U. S. domestic activities. Reflecting this attitude last year, Dr. Arthur F. Fleming, director of Defense Mobilization, exempted Canada and also Venezuela from suggested crude-oil import quota restrictions.

Import duties . . . This defense pattern is involved in the proposals that Canada duplicate the present U. S. import duties in crude and products. This has been urged as an effective way to increase demands for Canadian crude oil within Canada.

But important support for this program from the Canadian Government or from the larger oil companies which need the additional crude markets is lacking.

As in the United States there is a peace-time trade angle to Canadian oil imports. The dominion's economy is far more dependent on export sales than is the United States—20 per cent for Canada and less than 5 per cent for the United States. Canada's world trade is partially dependent on its petroleum imports. Analyses tend to show that at this time Canada's economy would lose more than it would gain by trimming its present dependence on foreign-oil supplies.

A parallel suggestion has been made that present U. S. import duties on crude oil and products be dropped or reduced in the case of Canada. It is contended this act alone would give Canada the additional markets in the United States it would need over the next few years. It also would make Canadian oil competitive with domestic supplies.

This proposal apparently is not being

THIS PEMBINA WELL is being drilled by Stanolind Oil & Gas Co., one of the major operators in Canada's largest field. The April allowable is 92,689 bbl. daily and production is rising steadily.

seriously considered by either government. It is realized that the favored-nation trade policy involving imports is well grounded in this country. Any change would have strong opposition generally in addition to that certain to come from the domestic oil industry.

Pipeline capacity . . . Fortunately those who have had the major responsibility for western Canadian crude oil have provided pipeline capacity for shipments much larger than those now being made.

Some observers say these lines are the answer for increased crude production starting soon.

To the west, Trans-Mountain Oil Pipe Line Co. has a 711-mile, 24-in. line connecting to refineries in Vancouver, B. C.-Puget Sound, Wash.

The pipeline rate of 47 cents per barrel to Puget Sound plants reflects the fact that the line has always been operated at part capacity. It moves about 125,000 bbl. daily at this time. A 24-in. line with adequate pumping facilities could transport in excess of 300,000 bbl. daily. If pipeline shipments were increased, the present relatively high per barrel tariff could be reduced resulting in lower delivered costs at refineries. The present rate might be halved with the line operated, near capacity, it is contended.

The present Vancouver refinery capacity takes care of the product requirements of Canada in that area. Large expansion would not be justified unless the extra output was for export outlets in the Pacific area.

This has led to the conclusion that the most logical and quickest solution to more markets for Canadian crude oil lies in more refinery capacity in the Pacific Northwest and also supplementary shipments to California.

Market analyses show that the Pacific Northwest could supply outlets for a refinery capacity up to 300,000 bbl. daily or 235,000 bbl. daily over present shipments to two Washington refineries.

Refineries under construction and planned will afford only a part of this possible increased capacity.

Spot shipments of Canadian crude oil have been made to San Francisco and Los Angeles refineries and more are to be made this year. These shipments, which are not now competitive with most grades of California crude oil, would be more attractive should the present Trans-Mountain tariffs be reduced. One analysis shows that the Alberta crude oil would be fully competitive with comparable California crudes to San Francisco refineries should the Trans-Mountain tariffs be reduced 18 cents per barrel.

Analysts, however, agree there are definite limits in the near term for expanding western Canadian crude markets in the Northwest and in California. Forcing the market would create a highly competitive and undesirable situation with California producers and refiners who formerly supplied the entire West Coast area with its products. The fact that California companies are substantial importers of crude from other countries where they have substantial producing interests complicates this situation.

Lines face east, too . . . To the east of the western oil provinces a comparable situation prevails.

The Interprovincial-Lakehead system of over 1,700 miles is designed for 30-in. capacity, and the Lakehead leg of 644 miles to Sarnia, Ont., was laid with that size.

The Sarnia refineries have a crude-oil capacity of 118,000 bbl. daily. It is pointed out that a 30-in. system could deliver crude to Sarnia up to 400,000 bbl. daily in excess of present shipments. This figure assumes a moderate increase in takeoffs now being made from the Interprovincial-Lakehead system at intermediate points in Canada and the United States.

This size movement, according to transportation analysts, could bring at least a 25 per cent reduction in the present 66-cent per barrel rate from Edmonton to Sarnia. This in turn would justify an extension of the Interprovincial-Lakehead system to Toronto and Montreal. It would mean that, based on present delivered prices for imported crude at the two points, Western Canadian crude could supplant all of the foreign supplies.

For reasons previously explained, this program for expanded domestic outlets to the east with reduced imports at this time does not have the support of either the Dominion Government or the Canadian oil companies most concerned. It is, however, part of the long-range planning for Canada.

Widening U. S. markets . . . At the same time, a reduction in the present Interprovincial-Lakehead tariffs would automatically widen the possible outlets for Canadian crude oil in the northern part of the U. S. Middle West.

A reduction of 15 cents per barrel in the Interprovincial-Lakehead tariff including intermediate points would justify further refinery expansion in the Wisconsin-Minnesota area. It might include such major refinery markets as Toledo, Detroit, and Chicago. This possibility is in the planning of some companies including U. S. firms with large western Canadian producing holdings but no outlets of their own in Canada. Other producers, crude-purchasing companies, and pipeline transporters in the United States are aware of this possibility. They are making studies on how to meet the assured increased competition from the north.

Gulf, Union Close Deal

California firm sells $120 million of its convertible debentures; Gulf calls it "an investment in the West"

NEW YORK.—Union Oil Co. of California is selling $120,000,000 worth of its 3¼ per cent, 25-year subordinate convertible debentures to Gulf Oil Corp.

Under the financial deal, Gulf ultimately may convert the debentures into 2,400,000 of Union's 7,331,790 outstanding shares of common stock.

Union in turn gets much needed capital for expansion and access to part of Gulf's crude production at the market price to supply its need for oil in the West.

Union President Reese H. Taylor immediately declared: "It should be clearly understood that this is not a merger of the companies, nor is one contemplated."

He explained, "Union retains its historic independence of management, policies, and operations. The transaction offers Union several important advantages. It supplies Union with funds to help finance increased capital expenditures contemplated under an aggressive program to keep pace with growth of the industry in the West, and it gives Union access to adequate crude-oil reserves."

Gulf, for its part, said the deal is an investment in the West, where it only has small reserves and no marketing or refining operations. Officials reported the company has not decided whether to use its right to convert the debentures to common stock over a 15-year period.

The deal . . . Gulf has already bought $60,000,000 worth of the debentures and will purchase another $60,000,000 block during the year. They are priced at $50 each.

The debentures may be converted into Union common at the price of $70 per share during the first 5 years, $75 during the next 5 years, and $80 during the third 5-year period. The conversion privilege terminates after this. Union common was quoted at 64⅛ last week.

If Gulf elects to convert all the debentures into Union common during the first 5 years, it will lay out a total of $168 million. The total investment would be $180 million in the second period and $192 million in the third.

What it means . . . Officials of both companies describe the financial deal as one of mutual advantage.

The sale gives Union capital to continue its aggressive expansion policy, especially for crude production outside California. The company presently has production and exploratory operations in California, the Rocky Mountains, New Mexico, West Texas, Oklahoma, the Gulf Coast, Western Canada, Alaska, and Costa Rica.

Its net proved crude-oil reserves are 497,700,000 bbl. with net production last year of 37,901,000 bbl. Union's reported 1955 earnings were $30.5 million, equal to $4.13 a share.

Union only recently brought in a significant discovery at Red Earth Creek in northern Alberta, Canada, where the company controls a large block of acreage. The company also reportedly has a new discovery in Costa Rica.

Gulf's net production in 1955 was 323,458,000 bbl. with a daily average net of 886,186 bbl. This includes 230,700 bbl. daily from domestic and 655,500 bbl. daily from foreign operations.

Most Gulf production came from Kuwait where its share averaged 479,600 bbl. daily. Gulf owns one-half interest in the Kuwait concession which has reserves rated at 40 million barrels. Gulf earnings last year were $218 million, equal to $8.19 a share.

In Pittsburgh, Gulf officials described the plan as a logical one for Union. Besides providing capital, it will give Union an additional source of crude supply from a noncompetitor. They said the oil probably would come from Kuwait, Canada, or Venezuela in present tankers.

Gulf said on its part the purchase of debentures was an investment in the West Coast.

In other deals recently, Gulf has increased its investments in the Western Hemisphere. It gained control through a stock-exchange plan of Warren Petroleum Corp., one of the nation's leading producers and marketers of natural-gas liquids. Gulf also is reportedly buying heavily in British American Oil Co., Ltd.

Don't fall for false economy . . .

. . . Buy Quality Communications

DALLAS.—"Spend more, not less, for your communication systems — it will pay in the long run." That was the advice given here last week by F. Vinton Long, communications engineer with Texas Eastern Transmission Corp.

Long spoke at the southwest district meeting of American Institute of Electrical Engineers, and made a scathing attack on the "buy-it-cheap" philosophy applied to microwave communications.

He said the industry is prone to buy microwave equipment on purely a first-cost basis, often without preparing detailed specifications which demand high-quality components. This forces manufacturers to cut corners on vital parts and on path design in order to get bids. The result is low first cost, Long said, but high upkeep and less reliability. He stressed that manufacturers are not to blame, having been forced into the position by buyer's practices.

His advice to industry communication engineers was to admit they could not compete with common carriers when channel requirements were low. Then, when private systems can be justified, design and build the best possible. He offered communication engineers the following points to consider in designing future systems:

. . . Raise equipment quality in general. Manufacturers are able and eager to build better equipment. Users must be willing to pay more at first although annual costs over long periods will be less. Demand use of tubes, resistors, etc., that are long lived, and a design wherein those components are underworked.

. . . Eliminate gadgetry that oftentimes won't work. Keep the system as simple as possible. Do away with part-time standby transmitters and receivers which are switched in when main units fail. Instead, pay a little more and keep two full-time transmitters and receivers in operation in both directions from a station, using diversity reception.

. . . Consider batteries for standby emergency power, even the long-life type such as nickle cadmium. This would eliminate more switching gadgetry and troublesome engine-generator units.

. . . Reduce station spacing to assure more reliable microwave paths. Design the path, even though it costs more, so there is plenty of fade margin under all conditions.

. . . Write specifications so that quality will be had from all bidders.

. . . Finally, impress management that there is more to the question of economical communication systems than low first cost alone.

Key Gas Line Sought

Colorado Interstate seeks FPC approval for $76-million project which will bring Rocky Mountain gas to Midwest

COLORADO SPRINGS. — Colorado Interstate Gas Co. is seeking approval of the Federal Power Commission for a big-inch pipeline project which will be the key to moving Rocky Mountain gas into the Midwest.

The project is part of a $116-million building program mapped by Colorado Interstate. It calls for $76 million on the big-inch job from Colorado to Nebraska, $11 million in 1957 for additions to transmission, production, and gathering facilities, and $29 million this year for extension of transmission lines.

While the major emphasis of the proposals is to move greater supplies of gas into the Midwest, an incidental result will be to create the nation's largest natural-gas pipeline grid.

If completed, the project will connect the gas fields of Canada, San Juan basin, Rocky Mountains, and the Texas Panhandle with service going to customers from the Pacific Coast to the Midwest.

The projects . . . Colorado Interstate's proposed construction includes:

. . . A 307-mile, 30-in. line from Idalia, Colo., to Beatrice, Neb. The line at Beatrice will connect with the main line of Natural Gas Pipeline Co. of America which serves the booming Great Lakes market *(The Oil and Gas Journal, February 20, page 92).*

. . . Two 26-in. feeder lines to the Idalia-Beatrice artery. One will be a 160-mile line from Carr, Colo., to Idalia linking the northern section of Colorado Interstate's system to the new trunk line and making Rocky Mountain gas available to the Midwest. The other will be a 75-mile line from Kit Carson, Colo., to Idalia. It will link the southern part of Colorado Interstate's system to the trunk line and make more Texas Panhandle gas available to the Midwest.

. . . A 215-mile loop of 20 and 24-in. from the Texas Panhandle to Kit Carson, and 34 miles of 16-in. tying the Keyes field of the Oklahoma Panhandle and the Greenwood field of Kansas into the double Kit Carson lines.

The plan . . . Natural Gas also plans to spend $80 million expanding its line from Beatrice into Joliet, Ill.

Both Natural Gas and Colorado Interstate hope to start construction in time to inaugurate deliveries late in 1957. Colorado Interstate before then will complete its new transmission line from Denver to Green River, Wyo., where it will connect with Pacific Northwest Pipeline Co.

Colorado Interstate can put 350 million cubic feet of gas daily into the big-inch line at Idalia for delivery at Beatrice to Natural Gas. The new supply includes 185 million cubic feet daily over the new southern feeder from the Panhandle through Kit Carson, and 165 million cubic feet over the Carr-Idalia feeder.

However, Colorado Interstate still will supply the Denver area with 100 million cubic feet daily over its Green River-Denver section and will also continue taking its present southwestern supplies over the Kit Carson-Denver leg.

Colorado Interstate will be supplied gas in the west either from the San Juan or from Canada over the Pacific Northwest line at the Green River connection. It has connections with Intermountain Gas Co. for gas from the Wind River basin at Rawlins, Wyo. It also has contracted for reserves in the Table Rock, Wyo., area.

In all, Colorado Interstate's project includes nearly 800 miles of main transmission lines and six new compressor stations with a total of 35,500 hp. Four other compressor stations will be increased a total of 17,800 hp.

Company's status . . . Completion of the facilities will expand Colorado Interstate's pipeline system more than 3,700 miles of transmission, sales, and gathering lines.

Annual gas sales will increase about 110 billion cubic feet—almost 50 per cent of sales last year. The daily capacity of the firm's transmission system will be boosted to 1.048 trillion cubic feet. Peak daily delivery capacity for both transmission and field systems will be increased to 1.348 trillion cubic feet.

Colorado Interstate controls a reported 8.6 trillion cubic feet of gas, enough for a 20-year supply under the proposed expansion and a 28.3-year supply to present customers on the basis of 1955 sales.

What it means . . . The proposed lines offer the first outlet to midwestern markets for Rocky Mountain gas. But they offer other possibilities too.

The gas fields of the Wind River and Green River basins, western Colorado, eastern Utah, and San Juan basin will have a possible new market.

The biggest natural-gas interconnection on the continent also is formed. It will tie in transmission lines of El Paso Natural, Pacific Northwest, Westcoast Transmission, Colorado Interstate and Natural Gas of America. The combined marketing area spans the Pacific Northwest, southern California, the Rocky Mountains and the U. S. Midwest.

In scrap for Chicago market . . .

. . . Midwestern Claims Price Edge

HOUSTON.—Midwestern Gas Transmission Co., which is associated with Tennessee Gas Transmission Co., has contracted to sell gas in the Chicago area about 7 cents per M.c.f. cheaper than the proposed wholesale price of competitors.

This was revealed last week in comparing contract prices offered by Midwestern and information recently filed with the Federal Power Commission by the Natural Gas Pipeline Co. of America and Colorado Interstate Gas Co.

Midwestern and the Natural Gas-Colorado Interstate group are engaged in a significant struggle before the FPC for the right to serve the rich midwestern market centering in Chicago *(The Oil and Gas Journal, February 20, page 92).*

When asked for comment on the competitive gas situation, a Midwestern Gas official last week stated:

"While information about the new proposal (as shown in the Natural Gas Pipeline-Colorado Interstate application) is far from complete, it is obvious from figures available that the wholesale price of this gas in the Chicago area must exceed 41 cents per M.c.f. as compared with the Midwestern price of 34.33 cents."

He explained that the 34.33-cent price is the 100 per cent load-factor price at which Midwestern has sold 145 million cubic feet of gas daily to steel mills in the South Chicago area. He also pointed out that the Midwestern system gas was offered sometime ago to potential purchasers in the Chicago area at 34.33 cents per M.c.f. at the full-load factor.

In addition, the spokesman said the 34.33-cent price is the basic price at which Midwestern has contracted to sell gas to customer companies, principally

in Minnesota, Wisconsin, and North Dakota. This is shown by exhibits on file with the FPC. Companies able to take gas at a sustained year-around rate will pay that price for their firm-load gas, he said.

Eau Claire, Wis., would be the meeting point in the proposed Midwestern system between gas from the Gulf Coast and gas from Canada. Midwestern proposes to bring 200,000,000 cu. ft. daily from the Gulf Coast and a like amount from Canada. Eau Claire would be the break-even point between the cost of gas from the two sources.

The Midwestern proposal is based on approval of its application to build a big-inch line from Emerson, Man., to Portland, Tenn.

The Colorado Interstate-Natural Gas Pipeline group proposes to bring Rocky Mountain gas into the Chicago area with pipeline legs from Laramie, Wyo., to Beatrice, Neb., and from there to Joliet, Ill.

In an application before the FPC, it was stated that cost of the Rocky Mountain gas delivered by Colorado Interstate at Beatrice to Natural Gas Pipeline would be 36.9 cents per M.c.f. This is the price at 100 per cent load factor. The price of this gas delivered at Joliet may be roughly 41 cents per M.c.f.

A third proposal to serve the Great Lakes area also is before the FPC. Northern Natural Gas Co. has proposed a 1,215-mile, big-inch line from western Alberta through Montana and North Dakota to Minneapolis where it will connect with other Great Lakes distributors *(The Oil and Gas Journal, March 19, page 118)*.

Products System Completed

LOS ANGELES.—Southern Pacific Pipe Lines, Inc.'s 176-mile, 6-in. product system servicing three Arizona and one California Air Force base has been completed and is ready to go into operation.

These new lines are laterals from the company's recently completed 418-mile Los Angeles-to-Phoenix products line. Jet fuels and aviation gasoline will be pumped eastward from the Norwalk Air Force storage terminal in East Los Angeles.

The lateral system consists of a 76-mile section between Davis-Monthan Air Force Base, Tucson, and Magma, Ariz. Another 58-mile section connects Williams Air Force Base at Phoenix with the Magma terminal while an 18-mile line services Luke Air Force Base from Phoenix.

In California, a 14-mile line connects March Air Force Base near Riverside with the Southern Pacific pumping station at Colton.

watching WASHINGTON

. . . with Bertram F. Linz

War plans guided by secret supply study . . .

THE difference between conventional and atomic warfare could be the difference between enough oil and not enough oil to meet all needs of the military and the civilian population.

What would happen if two nations dropped atom bombs on each other? The Defense Department has some ideas that will never be made public. With the Interior Department, it has made a full study of world supply and demand in such a situation.

A report which will guide the making of war plans deals with the ability of the oil industry to supply products to support an all-out mobilization and conflict in which both sides use nuclear weapons. It has been written for the joint chiefs of staff.

In the event of war, Russia would require as much oil as the U. S. to conduct the same type and volume of military operations. But there is a difference which might work to our disadvantage. Our civilian economy is geared to oil; Russia's is not.

Early adjournment won't anger oil men . . .

CONGRESS has passed quite a few bills this year—none of earth-shaking importance—despite charges it is doing nothing. And members may get away for the campaign fracas a month or more earlier than originally expected.

If Congress adjourns between July 1 and 15, which now looks likely, it would lessen by that much the chance of bills adverse to the oil industry. That would be welcome to the industry, for practically every oil bill pending is a kick rather than a boost.

At the moment, most of the oil bills are hung on dead center. A drive will be made to reduce the 27½ per cent depletion allowance to 15 per cent if opportunity arises. It would force the Treasury Department finally to reveal how it views depletion, which it has had under study for 3 years.

The bill to develop alcohol for blending with gasoline is a beautiful thing politically. It offers the farmer relief from surpluses, acreage control, and low prices. If it comes to a showdown it's hard to see how any congressman against sin and agricultural depression could vote against it. But Congress is likely to balk at putting up $100,000,000 to make the plan work.

The highway bill also is bogging down on the question of money. This is not a year to do anything that would increase the voters' tax burden.

These are the most likely areas of oil legislation, if any is passed.

Bill aims at antitrust lawbreakers' pocketbook . . .

SEN. HUBERT H. HUMPHREY of Minnesota has a new idea for discouraging antitrust lawbreakers.

Humphrey believes the courts have been too easy on corporation officials responsible for criminal violations by their companies. He offers figures to back that up. In the 66 years of the Sherman Act, he says, except for a few racketeers in the early days only three men have ever actually served jail sentences. And fines have been light. Although the maximum was raised from $5,000 to $50,000 last year, the average leveled against individuals since has been only $1,866 and in only one case has anyone been fined more than $5,000.

The senator has a bill to take care of this. By making the penalty civil rather than criminal he lifts the stigma which he says has influenced juries and courts to be lenient. His plan is very simple. It just provides that corporation officials shall forfeit twice the amount of their compensation covering the period of violation. And they could be enjoined from rendering any service to their company or a competitor, permanently or for from 90 days up.

Sour-Crude Producers Seek Help

- **Middle East cutback is urged to help West Texas operators with surplus oil**
- **Some help is coming, though as Cosden starts up plant, buyers take more**

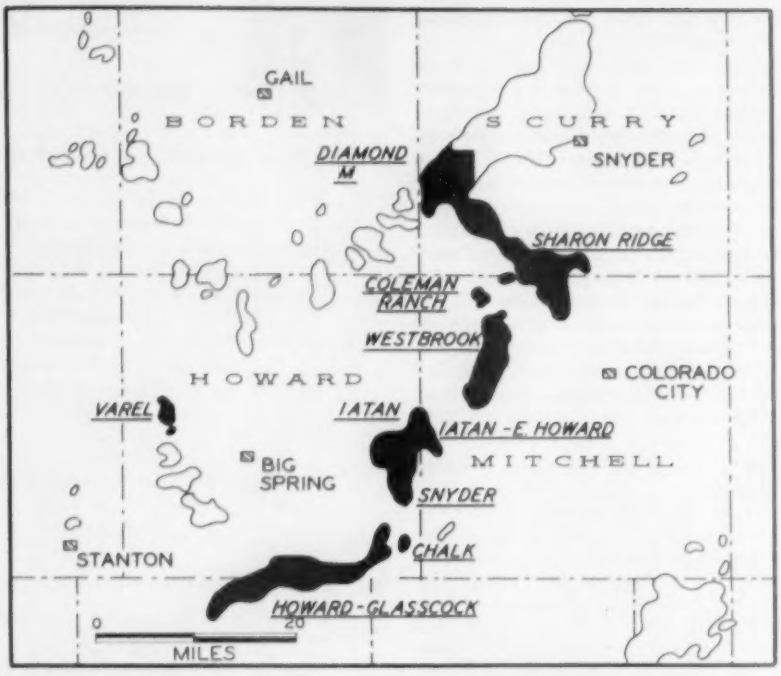
DALLAS.—West Texas producers are seeking a cutback in imports of Middle East sour crude to create a domestic market for 10,000 bbl. daily of their distress oil.

The hard-pressed producers will get some relief this month but they feel it is only a fraction of what is needed so they are turning to Washington for more help.

P. W. Pitzer, Jr., president of the West Central Texas Oil and Gas Association, appealed to Texas Senators Lyndon Johnson and Price Daniel to press President Eisenhower for a cutback in imports.

This is possible, Pitzer said, under powers given the President by the revised Reciprocal Trade Act. He also defended the move because the Middle East crude is sour and quite similar in type and quality to the West Texas distress oil.

Officials of the West Texas association reported the senators have agreed to place the matter before Eisenhower.



BLACK FIELDS on map are those where sour crude production has become a sizable problem in recent weeks. Varel and Westbrook have been hit hardest. Some say one or more fields might be abandoned if production is curtailed for long, and proposed water floods have been dropped or delayed.

Help on way . . . Meanwhile, partial relief is near from two other directions. It will provide a market for 3,000 bbl. daily of oil the producers could not sell last month.

Cosden Petroleum Co. has placed its catalytic cracking unit back on stream after a 6-weeks' shutdown for turnaround. This means the company can take about 1,500 bbl. daily more of the sour oil this month.

Shutdown of the cracker had pinched the producers because it aggravated the surplus oil situation. Cosden had been charging 10,000 bbl. daily of gas-oil to catalytic cracking. When the cat cracker was taken off stream, Cosden's gas-oil storage filled quickly. The company then had to cut runs to stills and lower its daily take of crude from leases to which it is connected.

Cosden's R. W. (Stormy) Thompson, vice president of production and pipelines, told the Journal flatly last week that reports published elsewhere saying Cosden is shutting down its sour-crude unit for overhaul are in error.

The company, he said, shut down the crude unit for necessary maintenance work last December and has no intention of doing it again for many months.

Thompson said Cosden in February bought from its connections a full 29 calendar days (in a 29-day month) of production. The necessity for shutting down the cracker pared the volume of oil the refinery could take in March to 24 calendar days' production from connected wells.

Though Cosden still has a great deal of gas-oil in storage, it will be able to take 25 days' production this month. The "days' supply" figures, Thompson explained, are based on actual producing capacity (within allowables) rather than on allowable production. Cosden, he said, has found that this is a more realistic way since allowables in the area on the average run well above producing capacity.

Backed-up gas-oil in storage, though reduced enough to permit the company to take the 1,500 bbl. daily this month, probably will not be worked off to the point where Cosden can again take a full 30 or 31 days' production, until July or August, Thompson said.

Three buyers to aid . . . On another front, three major crude-oil buyers are following through on pledges to take 150,000 bbl. of the distress crude from the area over the next 90 days—about 1,630 bbl. per calendar day total and about 550 bbl. daily for each purchaser.

The three buyers are Humble Oil & Refining Co., Magnolia Petroleum Co., and The Texas Co. The three responded to a general plea by Pitzer at the last state-wide allowable hearing. He asked for each of 13 large buyers to take 50,000 bbl. each or a total of half a million barrels over the 90-day period (*The Oil and Gas Journal, March 26, page 70*).

Humble, Magnolia, and Texaco said at the hearing they would take the volume provided the oil could be delivered to them. So far there have been no other takers. Sinclair, Shell, and Phillips have told the producers they can't take any of the oil because they already are badly overloaded with crude oil, including sour. The producers think there is a possibility some of the other buyers, however, may still pledge to help.

It now appears that the oil destined for the Humble, Magnolia, and Texaco refineries will be moving into pipelines in about a week.

Cosden and Shell are cooperating actively in the movement problem. Final details were being thrashed out last week on an agreement whereby Cos-

den would lease Shell's idle and boarded-up Westbrook pump station in Mitchell County. There is a 15,000-bbl. tank at the station, and a pump will be installed there temporarily.

The distress oil will reach Westbrook station through an old 6-in. line laid by Shell years ago from the Wasson producing area of Yoakum and Gaines counties past Big Spring to the Westbrook station. Most of this line is now inactive, but a portion of that section between Big Spring and the station is being used by Cosden under lease from Shell. The remainder on to the station can be put into operation quickly.

The Westbrook station is on the Shell 10-in. line from McCamey, Tex., to Cushing, Okla. From here, the oil will be moved through interconnections to Colorado City—one of the hubs of the West Texas pipeline system and a big crude-exchange point. At Colorado City, the distress oil will enter the Basin pipeline system and West Texas-Gulf Pipeline Co.

Magnolia has space in the West Texas-Gulf system and will move its quota to Beaumont through this big carrier. Texaco has space in Basin, and its share will go into that line. Humble will take its 50,000 bbl. via a trade-out agreement with Shell.

Allocation not known . . . Cosden Petroleum is handling the physical task of getting the oil to the large lines. As yet, the company doesn't know which fields or leases will get the additional market, Thompson said. "We'll probably need a referee," he added.

Pinched fields include Diamond M Clearfork and San Andres; Sharon Ridge Clearfork, 1,700 ft., 2,400 ft., and 2,900 ft.; Coleman Ranch and Coleman Ranch North; Iatan-East Howard and Iatan North; Westbrook; Howard-Glasscock; Snyder; Varel; and Chalk *(The Oil and Gas Journal, March 12, page 80).*

Hardest hit by pipeline proration are Varel and Westbrook. Varel is a relatively new field while the others are old pools rejuvenated by fracturing. All produce from relatively shallow pays.

The producers in these fields, mostly independents, contend that many of the wells are marginal and may have to be abandoned if the present condition is prolonged. Some projected water floods have been dropped or at least delayed.

The market for oil from this area for years has been primarily Cosden's Big Spring plant and another small refinery operated at Colorado City by Col-Tex Refining Co. The recent fracture-induced flood of crude has swamped these markets, and a general overload of sour oil in West Texas has made the larger companies reluctant to lay a line into the area.

Deep Zone Dry in R. & B. Well

PORT ARTHUR, La.—The world's deepest hole has missed its first chance to become the world's deepest producer.

Last week, Richardson & Bass recovered salt water from perforations at 21,533-21,622 ft. in its 1-L Humble-L.L.&E.-State Lease 2414.

At last report, the crews were pulling out of the hole with tubing in preparation for running a Baker retrievable squeeze-cementing tool. Richardson & Bass has not announced what the next step after cementing will be. There are other zones that might be tested including one below 19,000 ft. which was cored during drilling.

The operator perforated the deep sand about 2 weeks ago and displaced the mud in the hole with water. The well was swabbed through tubing but did not flow. Afterwards, salt water was displaced from the bottom of the hole.

In preparation for possible high-pressure producing zones, the operator has cased the hole with a string of 26-lb., 5-in. o.d. pipe with Hydril flush-joint, triple-seal joints. The well also carries a 30,000-psi.-test Gray christmas tree.

Industry BRIEFS

CALGARY.—Spring thaws have arrived in Western Canada, bringing the annual plague of drilling crews—road bans. The bans have required shutting down operations of at least 50 rigs, and another 50 are expected to halt as the thaw continues. Still drilling are about 200 rigs. The bans, which prevent rigs from shifting locations, are most numerous in Alberta.

CALGARY. — Dutton-Williams Brothers, Ltd., Calgary, has been awarded the engineering contract for building the 65-mile Cremona crude line from Sundre-Westward Ho-Harmatten field to Calgary. Pipe orders have been placed with Page Hersey Tubes, Ltd., and first deliveries are expected late in July.

WASHINGTON. — The Federal Power Commission last week authorized Atlantic Seaboard Corp. to add 86 miles to its natural-gas pipeline system in Virginia and West Virginia. FPC's certificate was for 31 miles paralleling Atlantic Seaboard's 26-in. line in West Virginia and a 55-mile line from Hardy County, W. Va., to Greene County, Va., connecting the firm's 26-in. and 20-in. lines.

VANCOUVER, B. C.—British Columbia Electric Co. is studying the possibility of laying an island-hopping submarine natural-gas pipeline to take gas to Victoria and Vancouver Island. The company has almost completed laying of a submarine high voltage power cable to the same areas.

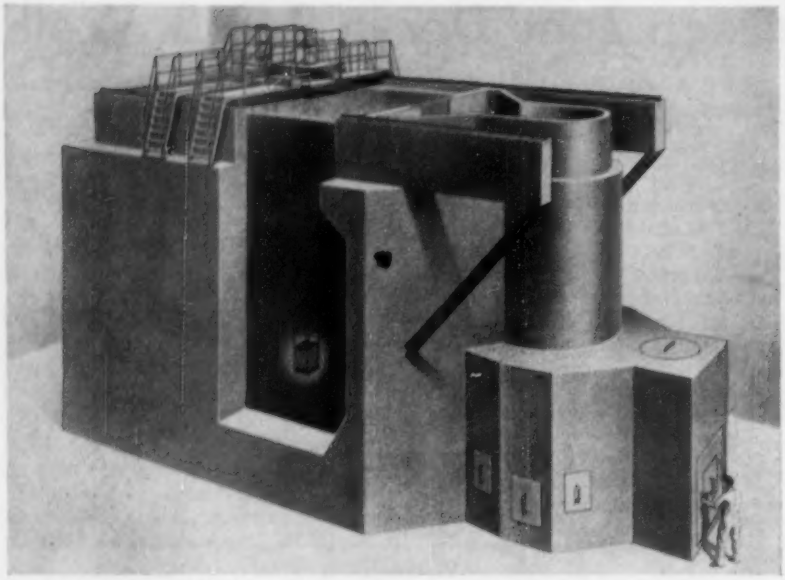
DALLAS.—Atlantic Pipe Line Co. has started taking oil from Amigo, Weger, and Farmers fields in northern Crockett County, West Texas. The crude will be moved to the Gulf Coast. The April allowable for the three fields is 4,000 bbl. daily from 138 wells, 23 in Amigo, 90 in Farmers-San Andres, and 25 in Weger. Drilling in the area is expected to continue at a high level.

LOS ANGELES. — Pacific Gas & Electric Co. plans to convert the nearly depleted Pleasant Creek gas field into its first natural underground storage facility. The field, discovered in 1948, lies northwest of Winters, Calif. It's estimated to have usable storage capacity of 3.25 billion cubic feet.

TULSA. — Siboney Development & Exploration Co. stockholders have voted to change the company name to Siboney-Caribbean Petroleum Co. Siboney is controlled by Crescent Corp. and Sterling Oil of Oklahoma, Inc., both of Tulsa, and Caribbean Petroleum Association, Inc. Sibony has a 5,200,000-acre concession in Cuba on which it is drilling its first wildcat.

WASHINGTON.—New York State Natural Gas Corp. of Pittsburgh plans to extend its pipeline system 27 miles to tap a new natural-gas field in Pennsylvania. The $1,538,000 project, for which the Federal Power Commission has given tentative approval, would run from Elk County to the Luthersburg field in Clearfield, Jefferson, and Indiana counties.

SANTA FE.—Western Development Co., Santa Fe, has acquired Mesa Oil Co., Artesia, N. M., and Permian Royalty Co. No. 2, Midland, Tex. The new properties will add income of about $300,000 a year. Western's outlay was $250,000 cash, a like amount in oil-production payments, and 269,504 shares of Western stock.



ATOMIC SWIMMING POOL is the name given this reactor nearing completion at Battelle Memorial Institute near Columbus, Ohio. Esso Research & Engineering Co. has contracted to use the reactor for experiments. Core of the reactor will be immersed in 28 ft. of water. Materials to be tested will be lowered from the bridge on left for exposure to radiation given off by the core.

Esso Steps up A-Tests

Company outgrows present nuclear facilities, contracts for reactor to speed up important petroleum experiments

NEW YORK.—The oil industry is going big league in its use of nuclear radiation.

Esso Research & Engineering Co. announces it has outgrown its secondary sources of nuclear energy. It plans to move up to the reactor itself for radiation in pursuing further studies in the new petro-nuclear field.

Observers see significance for the industry in the move. Most research officials believe the promise looks bright for using nuclear radiation to effect refining and petrochemical processes. They think Esso's action emphasizes this promise.

In the past Esso has used various radioisotopes or accelerators for its main sources of nuclear energy. Now it will add the reactor—a far more powerful primary source of energy. Reactors actually are atomic ovens which produce and harness atomic energy. The chain reaction or continual splitting of atoms required to produce atomic energy takes place in a reactor whose chief fuel is uranium.

The plan . . . Esso has contracted with Battelle Memorial Institute for a concerted program which will use Battelle's nuclear reactor now nearing completion at Columbus, Ohio.

Company officials say they realized some time ago that its operations were outgrowing its new radiation laboratory at Linden, N. J. It will still play an important part in Esso's over-all program. But the lab, using radioactive cobalt pipe as a radiation source, hasn't been able to keep up with the company's demands for expanded research.

Hence, the 3-year contract with Battelle which will bring the institute at least $250,000 per year.

The move will give Esso access to a new source with a hundred times more radiation including neutrons as well as gamma rays. It will greatly extend the scope of studying radiation effects on oil samples and will permit work to be scaled up to pilot-plant level.

Esso expects the Batelle reactor program to confirm findings from its current program and to open new possibilities not yet investigated at Linden.

The reactor . . . Battelle says its new "swimming pool" reactor will be the heart of the nation's most complete private atomic-research center.

Esso's work will share space with other projects in industry, agriculture and medicine.

The core of the reactor where fission occurs resembles a block about 2 by 2 by 3 ft., shielded in a 28-ft. deep pool of water. Other facilities include a hot-cell laboratory and a reactor development laboratory.

Battelle will conduct the actual experiments in close coordination with Esso's research personnel.

Big investment . . . This latest step will bring Esso's annual investment in nuclear studies to well over $1 million.

It will supplement the busy program at the Linden gamma-radiation laboratory and at an affiliated laboratory using a Von de Graaff particle accelerator as a source of beta radiation.

Reactor exposure actually is not a new field for Esso. The company is still carrying on irradiation work of an exploratory nature in the nuclear pile of the Atomic Energy Commission's Brookhaven National Laboratory on Long Island. These studies first indicated the good possibilities of radiation processing by producing gasoline and other oil products from small samples of petroleum.

No further results have been reported from Esso's radiation study since last November *(The Oil and Gas Journal, November 28, 1955, page 65)*. But the cobalt pipe which has the hottest radiation source ever shipped to a private concern and the limited exposures at Brookhaven apparently have satisfied the company that something big will come from this work.

The expected results evidently justify Esso's bid for more room in a reactor proper. Battelle, with a pile nearly complete, seems to answer the need for a stepped-up program in short order.

Gas System Started

SEATTLE.—Construction of the Pacific Northwest's first major natural-gas distribution system began last week. And some of its customers will be burning the new fuel by August 1.

Cascade Natural Gas Corp.'s $11,600,000 network will take San Juan basin gas from Pacific Northwest Pipeline Corp.'s long-delayed line from Ignacio, Colo., to Bellingham, Wash.

Additional gas for Cascade customers eventually will come from Canada's Peace River fields through Westcoast Transmission Co., Ltd.'s 650-mile line now being laid to the U. S.-Canadian border near Sumas, Wash. *(The Oil and Gas Journal, October 10, 1955, page 118, and December 5, 1955, page 72)*.

Cascade's feeder and distribution system will supply a long diagonal segment of Washington state extending generally southeastward from Bellingham to the Walla Walla area. An extension into Oregon will serve the Baker-Pendleton region. Natural gas will begin to burn in many Cascade cities August 1.

Scheduled construction calls for over 400 miles of mains and nearly 800 miles of customer service lines.

Revenue Fuss Over

Long Beach and California reach tidelands settlement

SACRAMENTO.—The California Assembly last week passed a bill aimed at settling the long dispute between the state and city of Long Beach over distribution of oil revenue from Long Beach harbor properties.

The compromise measure was approved 65-2 and sent to the Senate. It's scheduled for study by the Senate judiciary committe and the Senate financial committee before coming up for a vote in the upper house.

The bill is expected to get through the Senate without any trouble. But there have been reports upper-house members were irked because they weren't in on compromise talks. The bill is the outgrowth of 10 days' negotiations between state and city officials.

Terms of compromise . . . The bill calls for Long Beach to pay the state $120,000,000 of the $171,000,000 the city now holds in tidelands gas and oil revenues.

Hereafter the city and state are to split tidelands oil revenue 50-50. The state will get all money from dry-gas production.

The state share would be held as a water reserve fund for at least a year. Long Beach could use its revenue for a small boat harbor, bridge construction, and work to check land subsidence caused by oil production around the city. Long Beach has been barred by law from spending tidelands revenue for anything but harbor development.

Texaco May Enter Uranium

MONTICELLO, Utah.—The Texas Co. has taken an option to purchase the rich Happy Jack uranium mine in Utah from Bronson & Cooper Mining Co. of Monticello.

Happy Jack properties are located about 70 miles southeast of Blanding in San Juan County.

Although the purchase price was not disclosed, the mine previously had been under option for terms which could have run the amount to $30,000,000.

A mere $1,000 was paid for the properties in 1946 by Joe W. Cooper and Grant L. and Fletcher Bronson, all of Monticello.

Option to purchase the Happy Jack was taken several months ago by Barlu Oil Co. and transferred to National Mining & Milling Co. National later dropped the option on the open market.

Pipeline Maps Can Make a Big Spread Too

OMAHA.—It takes plenty of space to spread out a detailed, large-scale map of a big pipeline project.

Engineers for Northern Natural Gas Co. discovered this when they unfolded maps of the company's proposed 1,215-mile, big-inch gas line from western Alberta to Minneapolis.

Just the section of line from Grand Forks, N. D., to Minneapolis covered several feet of floor space (above). It is being reviewed by John Krajicek, left, chief engineer of field engineering; Byron Frances, center, chief engineer; and Joe Innis, right, vice president.

Northern Natural proposes to bring in surplus Alberta gas to bolster its supplies and reserves for serving U. S. Midwest markets and other pipeline companies marketing in the Great Lakes area *(The Oil and Gas Journal, March 19, page 118).*

Processing BRIEFS

CORPUS CHRISTI.—Suntide Pipeline Co. has completed a 40-mile, 8-in. crude line from Refugio to Pettus, Tex., with capacity of 25,000 bbl. daily. The line will make more South Texas crude available to Suntide Refining Co.'s Corpus Christi plant, which is being expanded from 52,000 to 65,000 bbl. daily. Some of the leases connected by the line had been without a market outlet and others were being served by truck.

WOOD RIVER, Ill.—A 7,500-bbl. daily catalytic reformer will be built at Sinclair Refining Co.'s 29,000-bbl. refinery here. Arthur G. McKee & Co. of Cleveland has the contract. An office building, storage tanks, cooling tower, and shop facilities also will be added by Sinclair. Completion of the reformer is due in about a year.

PITTSBURGH.—Gulf Oil Co. is well along on construction of four Gulfining units. Two of the units are being built at Gulf's Port Arthur refinery and will be complete in September. The other pair, at the Philadelphia refinery, will be finished early next year. The process will use hydrogen produced by cat reformers recently installed at the two plants.

LOS ANGELES.—Macco Corp. has received contracts to design and build diethanolamine and water-reclaiming units at Richfield Oil Corp.'s 140,000-bbl. daily Watson refinery. Cost is estimated at $500,000. The hydrogen sulfide recovered will go into sulfur manufacture.

PORT ARTHUR, Tex. — Koppers Co., Inc., has begun fullscale commercial production of polyethylene at its new petrochemical plant here. The plant has a capacity of 18 million pounds yearly and employes 200 workers.

NEW YORK. — Columbian Carbon Co. plans to expand its carbon-black plant at North Bend, La. First addition will be a 20-million-pound unit to be started within 90 days. A second of similar capacity is under consideration. Increasing demand for carbon black by the rubber industry was given as reason for the expansion.

Sun Expanding Test

Pump-blended fuels will be marketed throughout Florida, with first installations outside Orlando due next month

ORLANDO, Fla.—Sun Oil Co. is expanding its novel five-grade gasoline-marketing experiment to embrace the entire state of Florida.

Sun last week confirmed reports it is preparing underground storage for the two blending stocks and will begin installing the new custom-blending pumps at a number of Florida locations by May 15.

Several months will be required to equip all of Sun's several hundred stations in the state.

The experiment will continue along the lines revealed when Sun first announced its marketing test in late February *(The Oil and Gas Journal, February 27, page 56)*.

At that time the company had decided that it would expand the experiment statewide if no particular difficulties were encountered. This would enable the company to gage customer reaction more thoroughly than is possible in only 17 stations in the limited Orlando area.

Wayne Pump Co. is hard at work turning out the new blending pumps on a hand-assembly basis. They will be installed as they are delivered. *(For picture and diagram, see The Oil and Gas Journal, March 5, page 56.)*

Sun declined to reveal how many stations and pumps this expanded program would embrace, but it is estimated that the company has about 400 stations in the state. Once under way, this experiment will constitute a major marketing effort on the multigrade basis, equivalent to the entire setup of many independent refiner-marketers operating in this country.

What's involved . . . The octane range of the Florida experiment will follow that set up originally at Orlando.

The company will use its new Blue Sunoco 200 as a base blend, adding octane concentrate in increasing amounts as the customer desires. The range is roughly from 94 research octane for unblended Blue Sunoco to about 102 research octane for the top 250 grade.

No information has been released on the composition of the Sunoco octane concentrate, but it is variously believed in the trade to comprise a high-octane blend or reformate, probably including alkylate, isopentane, and tetraethyl lead.

The two blends are balanced on vapor pressure, distillation and other characteristics, and TEL content to produce similar gasolines in the five octane categories.

Industry reaction to Sun's marketing experiment has been one of high interest. One other major oil company is understood to be seriously considering following suit if Sun decides to apply the multigrade concept to its entire 19-state marketing area.

It's all high-octane . . . One point which has elicited particularly favorable comment from the industry is the 5-cent spread between the lowest and highest grades.

This spread actually applies over an octane range which is apparently not much greater than the current six-number spread which exists between weighted averages for regular and premium grades marketed in this country.

Although the top octane is presumably nearly six octanes over the national average of 96.4 for premium, the lowest grade at about 94 octane is 4½ numbers higher than the national average of 89.3 for regular and only 2½ numbers short of the 96.4 level for premium.

Hence, the Sun grades straddle the higher octane levels now existing around the country and extend beyond the 100-octane level which now commands so much interest.

In its annual report Sun revealed plans to add two more catalytic reforming units at the Marcus Hook and Toledo refineries, plus a new alkylation unit at Toledo. With three Houdriformers now in operation, the company maintains an average capacity in this process type of about 20 per cent of crude capacity which is double the industry average.

The new units, of unnamed capacity, would further boost Sun's ability to produce high-octane gasoline in major commercial quantities.

More Alberta Gas Finds Outlet

CALGARY.—A contract just signed with Saskatchewan Power Corp. will give five producers an outlet for 383 billion cubic feet of shut-in natural-gas reserves.

Britalta Petroleums, Ltd., of Calgary, and Crescent Corp. of Tulsa, are to sell at least 210,870,000,000 cu. ft. over a 20-year period from Many Island Lake field in southeastern Alberta.

Similar contracts were signed by Canso Natural Gas, Ltd., Amurex Oil Corp., and Canadian Export Gas, Ltd., for 172,000,000,000 cu. ft. in Alberta and southwestern Saskatchewan.

Saskatchewan Power proposes to build a gathering system and trunk line from the Alberta-Saskatchewan border to supply Swift Current, Moose Jaw, and Regina in Saskatchewan.

The project would involve laying about 250 miles of trunk line from the field to Regina.

Approval of the necessary regulatory bodies is considered a foregone conclusion. Saskatchewan Power is a crown corporation. The project has advance cabinet approval, and the money reportedly is already budgeted. The line would parallel the first part of the huge Trans-Canada project which hasn't been started yet.

Contract terms . . . The contract is considered one of the best ever signed in Canada from the producer's standpoint.

The wellhead price will be 9 cents an M.c.f. for all deliveries prior to October 31, 1957. The price goes up to 10 cents the next 2 years. For the 3-year period starting October 31, 1959, a new figure will be negotiated.

If the contract parties are unable to agree, the price will be settled by arbitration. One umpire will be selected by the producer, one by the power company, and a third by both of them. In no case will producers receive less than 10 cents an M.c.f.

Gas requirements under the contract are estimated at 383.4 billion cubic feet for the 20-year period. Estimated annual requirements will be disclosed to producers at least a year in advance of delivery rates. Southwestern Power must take or pay for, (1) 50 per cent of its estimated annual requirements, or, (2) 50 per cent of all the natural gas consumed or resold along the route within 20 miles of the pipeline, whichever is greater.

Reserves . . . Many Island Lake field was discovered in 1951 by Crescent (formerly Deep Rock Oil Corp.) and Britalta. Production is from 1,400 to 1,500 ft.

Recoverable reserves are estimated at 439 billion cubic feet by DeGolyer & MacNaughton, Dallas consultants, and 529 billion cubic feet by Britalta engineers.

Big Fields Joined

Triple-N, Emma form major Ellenburger producing area

DALLAS. — Development drilling in West Texas has joined two large oil pools into one of the biggest fields producing from the prolific Ellenburger formation.

The two fields, formerly believed separate reservoirs, are Triple N and Emma in extreme southern Andrews County.

Triple N has 2,160 developed acres and 27 producing wells. Emma has 1,650 acres and 41 wells.

Neither area is defined yet, and many think the proved area will eventually reach 5,000 acres.

The physical joining of the two areas hasn't been recognized officially by the Texas Railroad Commission.

It may be soon, though, as a result of a hearing held March 30 in Austin on an application by Gulf Oil Corp. that the areas be consolidated. Suggested new name for the field is Triple-N (Ellenburger).

The structure . . . Gulf told the commission that all evidence shows that the two areas produce from a common reservoir.

Geologist R. H. Cress of Gulf exhibited a subsurface structure map, contoured on top of the Ellenburger dolomite, showing the structure to be a northeast-southwest trending anticlinal dome.

There is no evidence, he said, of structural separation between Triple-N and Emma. There is evidence of faulting, but no faults or impermeable barriers have been found which would separate the two areas or prevent free communication of oil.

The Ellenburger produces from the fields at depths ranging from 12,160 to 12,630 ft. It has a gross thickness of about 260 ft. in the proved area and is heavily fractured with some vugular porosity.

The pay contains no free gas and has an active bottom-water drive.

Triple-N was discovered in February 1952, Emma in October 1953.

The two together had produced more than 5,000,000 bbl. of oil as of February 1.

All agree on one field . . . Though at least eight other operators testified, none disagreed with Gulf that the two fields actually produce from the same reservoir.

There was a lot of disagreement, however, over the kind of field rules which ought to be adopted if consolidation were approved.

Triple-N was developed with 80-acre proration units and Emma with 40-acre units. This is the principal field-rule difference between the two.

Several companies opposed consolidation. They argued that the commission is not required to join two fields producing from a common reservoir under common rules if they were developed separately and under different rules.

Firms Shun Meeting

Antitrust danger keeps oil men off advisory committee

BATON ROUGE. — Producers and purchasers of crude oil in Louisiana are reluctant to help trim the state's production allowable.

It's not that they're all opposed to a cut. Some of them would welcome it. But there's a fear of possible legal reprisals against companies helping to devise a new formula.

Conservation Commissioner John B. Hussey invited industry spokesmen to a meeting here last week to exchange ideas on the problem of balancing production with decreasing spring demand *(The Oil and Gas Journal, April 2, page 88)*.

Hussey said some companies indicated a reluctance to send spokesmen to the meeting "because of fear they might be involved in antitrust action."

The meeting failed to produce the intended advisory committee to assist in the problem. Instead, it was decided that producers who wish to participate should say so in writing.

Hussey emphasized that the committee will act only in an advisory capacity and will have nothing to do with price setting.

The commissioner said no "drastic cut" in the state's production allowable is anticipated for May. But he warned that subsequent reductions may be ordered.

S-P Plans New Products Line

LOS ANGELES.—Southern Pacific Pipelines, Inc., is planning to build a $16-million products line to span the Sierras and connect San Francisco with Reno and Fallon, Nev. The line also would serve the Sacramento Valley, midway point on the proposed route.

The company is making surveys and engineering studies along the Southern Pacific Railway right-of-way, which the line would parallel. No pipe sizes have been determined yet.

Southern Pacific recently put into operation two products lines serving Arizona points from both El Paso and Los Angeles.

Trade Pact Changed

House retains authority to control oil imports

WASHINGTON. — The House this week will be asked to approve U. S. membership in the international Organization for Trade Cooperation but under conditions protecting the effort now being made to regulate oil imports.

The ways and means committee approved the OTC before the Easter recess. But it wrote into the measure a number of provisions that will substantially weaken authority of the international agency to dictate U. S. tariff policy.

The most important amendment provides that nothing in the bill shall be construed to repeal or modify any existing legislation or alter the power given the President in the Reciprocal Tariff Act to change duties.

Effect of this restriction will be to keep alive the national security amendment written into the tariff act last year. It is under this amendment that the Office of Defense Mobilization is trying to work out a scheme for limiting oil imports.

Two other amendments were put into the OTC bill. One stipulates that membership in the OTC shall not commit the U. S. to enact any specific legislation on tariff matters. Another bars the OTC from any connection with the United Nations. Its functions would be limited to administration of the general agreement on tariffs and trade and aiding intergovernmental cooperation in the field of trade.

Big Sulfur Plant Under Way

PINCHER CREEK, Alta. — Work has begun on Canadian Gulf Oil Co.'s $2.5 million sulfur-extraction plant here. Initial operation is scheduled for next October.

Contract for building the sulfur plant was let to Parsons Engineering Co., and Stearns-Rogers Engineering Co. will build the hydrocarbon treating and cycling plant.

The project adjoins the eastern edge of Pincher Creek gas field. When complete, it will extract 150,000 tons of sulfur per year from about 170 million cubic feet daily of gas supplied by Pincher Creek wells. Bulk of the sulfur, to be over 99.5 per cent pure, will be sold to Northwest Nitro-Chemicals, Ltd., Medicine Hat. Residue gas will go to Trans-Canada Pipe Lines, Ltd.

The gathering system will be automatically controlled by a telemetering system at the plant.

Two MER's for One Pool?

Texas Railroad Commission to decide that issue at new hearing on Gulf's application involving Goldsmith field

AUSTIN.—Can there be two maximum efficient rates of production (MER's) in one reservoir?

That is a problem confronting the Texas Railroad Commission in its effort to decide what's best for huge Goldsmith field in West Texas' Ector County.

The joker in the situation is that part of the field is unitized and part is not. The unitized portion, which takes in the field's south dome, has a highly effective pressure-maintenance program, while the nonunitized part has not. The unit takes in more than half the field.

Bottom-hole pressure in the unit is climbing steadily. In the north nonunitized portion it is declining just as steadily.

Early in January, Gulf Oil Corp., as operator of the Goldsmith San Andres unit on the south dome, came to the commission with a request that the MER of the unit be hiked from 16,250 bbl. to 27,000 bbl. per schedule day.

Gulf also asked that the MER in the north end of the field be continued at 10,000 bbl. because "there has been no change in the producing mechanism in that portion of the reservoir."

Ira Butler, Gulf attorney, said the commission "had never refused to grant an increase in the MER where it appeared that the resulting allowable could be produced without loss of pressure and where the existing MER was below the 1947 yardstick. The allowable which would result here would be only 55 bbl. per well per producing day, which is 18 bbl. below the 1947 yardstick."

Butler said if the commission failed to grant the application it would reverse policies it previously had followed and would discourage the launching of similar beneficial projects.

Other companies in the unit backed Gulf. But formidable resistance arose among producers in the north end.

Stanolind Oil & Gas Co., Humble Oil & Refining Co., and Shell Oil Co. emphasized the danger of setting up two MER's in the same pool.

Humble argued that a further, full hearing should be held after notice to all concerned before the commission considered different rates for different geographic areas of the reservoir. Shell agreed. Stanolind said it would have no objection to the same MER increase distributed equitably among all wells in the field via the field allocation formula.

The commission admitted that it had run into nothing like this before. It finally held February 27 that it could not approve two different MER's for Goldsmith under the law.

Gulf continued to push hard, however, and the commission agreed to listen to oral arguments on its initial ruling March 19. It did and apparently was impressed. Last week, at any rate, the commission agreed to a rehearing on the application in Austin May 21.

Its decision next time probably won't be any easier to make.

The arguments for . . . The Goldsmith San Andres unit was launched officially October 1, 1952, as one of the largest and most significant pressure-maintenance projects ever carried out. Water was first injected in October 1954 *(The Oil and Gas Journal, December 6, 1954, page 86)*. The water and gas-injection program was confined to the field's south dome, embracing 18,400 acres of the 31,000 acres in the field.

Water was injected below the water-oil contact through 31 input wells in two rough concentric rings around the south dome. Gas was injected into the gas cap through four wells on the crest of the structure.

This, Gulf pointed out, is the first such pressure-maintenance operation in Texas, a type which the commission several years ago suggested as ideal.

The program has been highly successful to date. The unit points out that bottom-hole pressure is climbing about 50 psi. a year. It had been dropping 46 psi. a year before.

Meanwhile, pressure in the nonunitized portion still is falling about 42 psi. a year.

Volume of water and gas injected is 63 per cent greater than production in the south dome, thus forcing the pressure hike.

The average gas-oil ratio in the unit has been cut from 2,652:1 before injection to 1,706:1 last December. Ratios in the north end last December, the unit says, averaged a whopping 6,850:1.

Unless the unit gets a higher MER, it argues, it will "inescapably be subjected to drainage of oil to the low-pressure nonunitized area to the north." Unit spokesmen say that the average producing day allowable per well in the unit is only 34 bbl. a day—39 bbl. a day below the 73-bbl. yardstick.

The commission order turning thumbs down on the Gulf application, they say, also discriminates against it as compared with hundreds of other fields in Texas "enjoying much higher allowables, based either on 1947 yardstick or upon reservoir performance."

The commission, Gulf lawyers argue, very definitely has the power to grant separate MER's for the two Goldsmith areas.

It has this authority, they contend, under the unitization act, the law of correlative rights, and the statutory provisions regarding waste as construed by the courts. Moreover, there is no statutory provision which prohibits setting up separate MER's in the same reservoir.

The case against . . . Stanolind, one of the operators in the north end, sees it differently.

The company thinks the commission has no authority to fix separate MER's.

Even if it does have, Stanolind lists these reasons why the application should not be approved:

. . . Greater inequities by far would be created by a policy of approving geographical regulation of parts of reservoirs than the Goldsmith unit would suffer if the application is rejected.

. . . Administrative problems under such regulation would be overwhelming.

. . . Approval of separate MER's for parts of a reservoir would mean that the commission should go further and set up an MER for each well based on performance, and either of these is impractical and unworkable.

The Goldsmith unit's charge that denial of its application would discourage the undertaking of other such projects also drew fire from Stanolind.

The company argued that the commission does grant incentives for pressure-maintenance operation by policies such as its net gas-oil ratio rule.

Admitting that production in the north end is less efficient, Stanolind argues that it is not the law that the commission use compulsion or force to see that all oil fields in the state are

operated at their maximum efficiency. The unit area, it argued, already enjoys an advantage in that the average allowable there is 31.3 bbl. per well as compared with 23 bbl. per well in the north end.

The commission appears to feel that the case isn't as clear cut as either side sees it. It will do considerable soul-searching as to consequences of a decision either way before it makes up its mind after the rehearing May 21.

Bay Buys Red Dot

T.G.T. subsidiary expands retail-gasoline marketing

HOUSTON.—A major gas-transmission company took another step into the gasoline-marketing field last week.

Tennessee Gas Transmission Co. announced that its wholly owned subsidiary, Bay Petroleum Corp., had purchased the physical assets, leases, and distributorship rights of Red Dot Oil Co. of Colorado.

R. R. Dean, president of Bay Petroleum, said the company would assume immediate operation of the 19 service stations and a distribution warehouse formerly operated by Red Dot in the Denver area.

Bay has two refineries—one with a rated capacity of 8,000 bbl. per day at Denver and the other an 18,000-bbl. plant near New Orleans. A $1,800,000 expansion and modernization program now under way will increase the capacities to 9,500 bbl. and 23,000 bbl. per day, respectively.

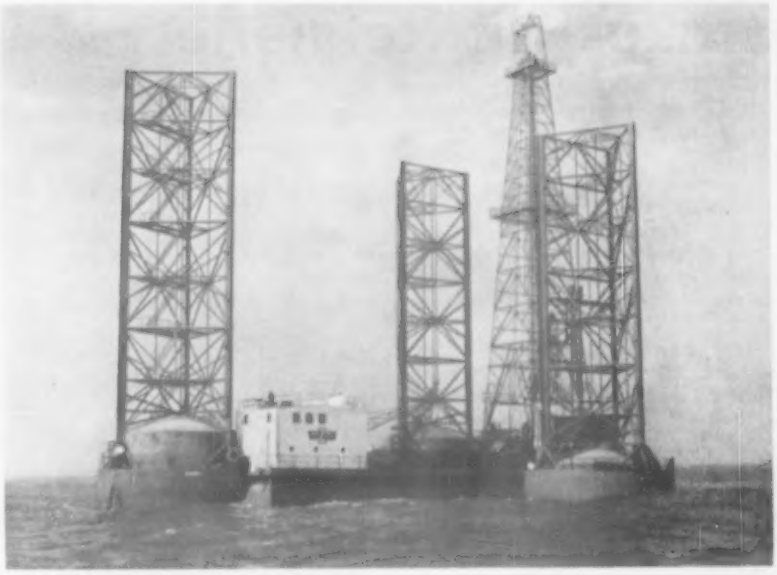
Six of the new Bay service stations and the warehouse were owned by Red Dot while the other 13 stations were operated by that company under leases. Bay acquired these leases in the transaction announced last week. Also included in the deal were Red Dot's inventories of auto accessories and all copyrights, trademarks, and patents of Red Dot and its subsidiary, Split Second Corp.

Red Dot distributed Bay products through 41 additional service stations which now will be served directly by the T.G.T. subsidiary.

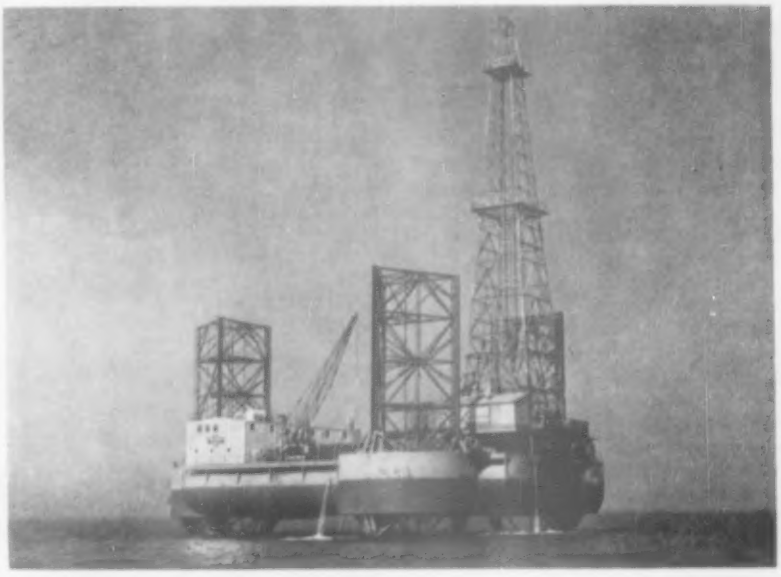
Tennessee Gas entered the retail gasoline field, as well as the refining business, through purchase of the old Bay Petroleum properties last spring *(The Oil and Gas Journal, June 13, 1955, page 133)*.

The company paid an estimated $19,000,000 for the two refineries, marketing outlets, and producing properties yielding about 5,300 bbl. of crude oil daily.

Tennessee's production, now totaling about 20,000 bbl. of crude daily, is handled by the parent company.



Zapata Unit Towed to Sea . . .



. . . And Anchored for Drilling

GALVESTON. — Zapata Off-Shore Co.'s three-legged platform, the "Scorpion," is ready for it first assignment in the Gulf of Mexico off the Texas coast.

Designed and constructed by R. G. LeTourneau, Inc., the platform's first job will be for Standard Oil Co. of Texas. The location is in water 46 ft. deep. The structure is capable of operating in water twice as deep.

The platform was towed from Galveston (top photo), where it was outfitted for drilling to a wildcat site off Port Aransas. There the legs were lowered to the ocean floor and the deck elevated to drilling position (bottom photo).

The "Scorpion" cost about $3,000,000 to build and equip for offshore operations. It's the first of tripod design to be used for gulf drilling. Much of the equipment was engineered especially for this platform.

Strikes Hit Refineries

Cities Service, Shell and Lion plants are shut down by union disputes; other oil projects closed on Gulf Coast

STRIKES stemming from disputes over wages and seniority rights shut down a third U. S. refinery last week, closed a petrochemical plant, and halted refinery construction on the Gulf Coast.

The 55,000-bbl. daily refinery of Cities Service Oil Co. at East Chicago was closed by strike early in the week. The walkout was called by local 210 of the Oil, Chemical and Atomic Workers International Union in a dispute over seniority rights.

Officials of Cities Service reported the company offered the union increases equal to those offered and accepted by all other unions in the company and elsewhere in the industry.

Cities Service reported the union "insisted upon institution of straight plant-wide seniority without appropriate regard for ability and other qualifications." This practice would subject both the employes and plant facilities to great danger and hazard, the company said.

A union official said there were many points at issue.

Gulf Coast trouble . . . Meanwhile at Houston, 700 O.C.A.W. members went on strike at the Ethyl Corp. plant in a dispute involving pay scales and job classifications.

Supervisory employes continued operating the plant without interruption.

Ethyl officials said a 6 per cent wage increase and higher shift differentials had been offered.

In the Beaumont area, construction work was halted at several refineries and petrochemical plants when nearly 10,000 workers struck for higher pay.

Strikers are members of Pipefitters Union Local 195 and Operating Engineers Union Local 450. Pipefitters rejected pay raises of 25 cents an hour spread over 3 years. Operating engineers reportedly turned down a 10-cent hourly increase each year for 3 years.

Strikers get help . . . On the West Coast, the big Anacortes refinery of Shell Oil Co. remained closed by strike and O.C.A.W. officials made plans to send "very substantial financial" support to their striking members.

The District 1 Council of O.C.A.W. voted last week at Bakersfield, Calif., to send an undisclosed amount of funds to the Anacortes union. It also mapped a program calling for monthly contributions by West Coast workers to support the strike.

One source estimated that 14,000 West Coast oil workers will be asked to contribute $5 monthly. Another said the O.C.A.W. hopes to send as much as $50,000 monthly to Anacortes.

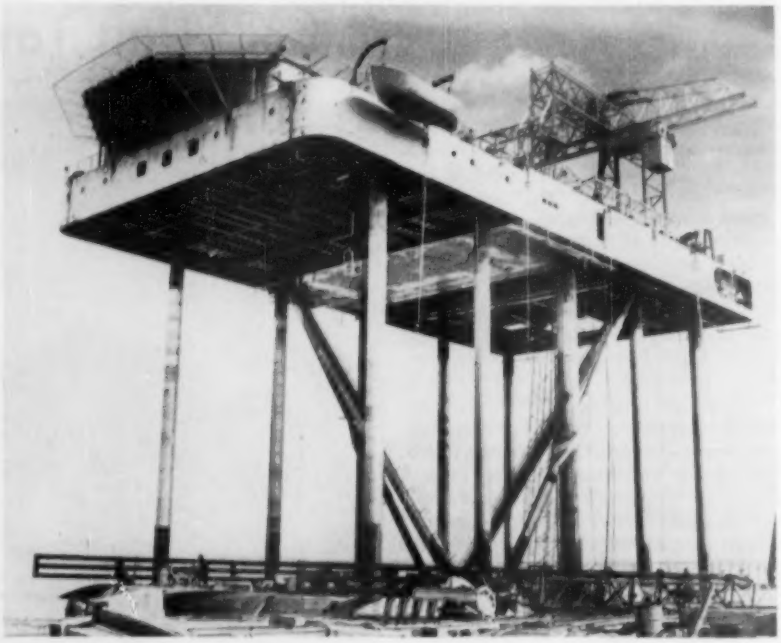
The 50,000-bbl. refinery was struck March 24 in a dispute centering mainly on wages. The 309 operators and maintenance men who had started up the new plant only in December shut it down.

Negotiations on the refinery's first contract with O.C.A.W. broke down after the company refused union demands for a 25-cent per hour increase across the board, plus individual classification increases. O.C.A.W. said the strike is aimed at ending the disparity in wages between Texas and the West Coast. Union spokesmen said Texas workers now have a top of $2.85 an hour while the West Coast top is $2.63.

Shell offered the standard increase accepted nationally by the oil industry early in March. It provided increase of 6 per cent or 15 cents an hour, which ever is greater, a flat $26 monthly for salaried employes, and adjustments in shift differentials.

Lion shut down . . . A third domestic plant remained closed by strike for the fifth week. It is Lion Oil's 27,500-bbl. daily El Dorado, Ark., refinery.

Strikers are members of the operating engineers union who walked out in a dispute over wages. Negotiations have not been resumed since the walkout early in March.



New Calco Barge Is on the Job

NEW ORLEANS. — The California Co.'s new elevated-deck drilling barge, S-55, has gone to work north of Pass a Loutre at the mouth of the Mississippi River.

Recently completed by Avondale Marine Ways, Inc., the vessel is designed to operate in 75-ft. water. It is one of the largest portable, self-stabilizing, submersible drilling units yet built.

The vessel is 190 ft. long and has a 150-ft. beam. It has quarters for 84 men.

In the lower hull are ballast and fresh-water pumps, as well as fresh water and fuel oil. Mud pumps and pits are on the main deck. The unit is equipped with a four-well derrick.

The S-55 was designed by Friede & Goldman, Inc. Among its special features is an antiscouring hull fitted with antiscouring coaming.

Avondale is building a similar, but smaller, unit for Delta Offshore Drilling Co., Inc. This vessel is expected to be completed about mid-summer.

Proration Hurt Floods?

Field case histories show it's more damaging to water floods to drop input rate than to restrict production

WICHITA.—Is it harmful to restrict water-flood production?

That depends on the nature of the reservoir fluids and the rock being flooded. It also depends on the extent of unitization of the reservoir and whether water input rate is changed.

That is what E. E. Funk, Cities Service Oil Co., Bartlesville, told oil men assembled last week for the A.P.I. district meeting here.

Before water-flood proration can be fairly considered, however, it should be required that complete reservoir water flooding be in progress and that all operators be put on a similar time and rate basis.

Because input water increases reservoir pressure and moves the oil toward lower-pressure producing areas, a lease not upholding its share of injection would receive undeserved oil from neighboring leases when production from those leases was curtailed.

Field performance, Funk said, shows that reducing the rate of water input is more damaging than reducing production. Most water flooders are very reluctant to reduce water input. If the water rate can be maintained or possibly increased during a water flood, then in many cases oil production can be restricted for short periods without hurting ultimate oil recovery.

However, for any operator to do this without being hurt, it is necessary that all leases participate fully. Some of the worst cases of loss have occurred when oil flowed from a water-flooded lease to an adjacent lease not under flood.

Injection rate important . . . The accompanying figures show possible reasons why maintenance of water-injection rate is important.

The uniform sand core is being flooded and the water banks up the oil and displaces it efficiently. But when input water is shut down, gravity separates the two fluids, the flood front breaks up, and recovery suffers.

The formation being flooded, however, has streaks of high and low permeability. Water progresses faster in the higher-permeability streaks but in both high and low permeability the water banks up the oil. When water input rate is reduced and pressure drops, flow may stop entirely in the tighter streaks. Then gravity separates water and oil and efficiency of flooding will be less even if the higher rate of water input is resumed.

What happens when water input drops

Sandstone Core

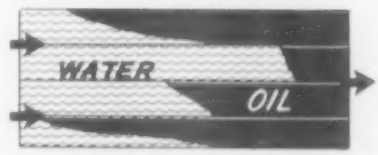
Uninterrupted flood

Flood after shutdown

Sandstone Reservoir

. . . With varying permeability, separated into thin zones by impermeable barriers.

With steady input



After input rate reduced

Permeability and oil loss . . . Permeability has been the predominant factor affecting the loss of oil as a result of oil production restriction.

Funk showed field production histories where three out of five water floods were hurt by production restriction. In each of the three cases, permeabilities of the formations varied from very high to low.

Funk also observed that most successful water floods recover most of their oil accompanied by water production. This is contrary to laboratory floods where high oil recovery occurs before water breakthrough. The reason, he said, must be the wide variation of permeability in the reservoir rock. This allows water to break through in one streak before the tighter zones are flushed.

Other factors . . . The influence of formation permeability on rate sensitivity can occur even when the favorable condition of a flood front occurs. But conditions of the reservoir fluid and rock may affect the sharpness of the front and also contribute to rate sensitivity.

Chief factors that may enter in are the mobility ratio between the water and oil and the natural wettability of the reservoir rock. Various investigators have been divided in opinion on the influence of these effects, Funk said. Results have shown both flood rate sensitivity and absence of sensitivity.

Probably the big reason these effects have not been substantiated is that favorable water-wet systems and favorable mobility ratios have existed in most successful field floods. Water-wet systems are not likely to be rate sensitive in homogeneous rock. But some floods may be oil wet or partly wet by both water and oil. These may be quite sensitive to flood rate. Flooding of viscous oil may also be sensitive to rate.

In any case, Funk concluded, regulatory agencies need a wealth of pertinent data to decide that proration will not be damaging in any particular flood. Tests have shown that short periods of production restriction may or may not hurt ultimate oil recovery, depending on the reservoir characteristics.

Who Owns River Beds?

DENVER.—The Colorado attorney general's staff is thumbing through statute books in an effort to determine ownership of the state's river beds.

The question arose when Monsanto Chemical Co. asked the State Land Board to grant it leases on about three-quarters of a mile of South Platte River bed. Location is in extreme eastern Morgan County, near the Washington County line, where the firm already owns oil leases adjoining the stream. The company said it is entitled to protection for oil which might be discovered when it drills on its leases.

A. M. Ramsey, land board president, said there may be lawsuits over the unprecedented question. He added every major river in the state may ultimately be affected, and that millions of dollars—either for individuals or for public schools—may be involved.

In at least one case, the Colorado Supreme Court has held that land in a stream bed belongs to the owners of property on either or both sides of the stream.

With 1 in. per mile scale . . .

Conoco Has King-Sized Maps

HOUSTON.—Most companies frown on employes who spend office hours staring at the wall. But it's expected of top executives in Continental Oil Co.'s exploration department.

For by staring at a wall—the right wall—they can quickly spot any well drilled on or near Continental acreage any place in the world. Merely by pressing a button, Continental exploration men can transform a bare wall into a detailed map pinpointing any area in which the company operates.

"Operation Stare" is a daily procedure in the newly completed map room high in the new 21-story building which houses Continental's main offices. Four draftsmen keep the giant maps up to date so the staring operation won't be wasted on old data.

Continental claims its map room is the largest and most modern in the industry. The room is about 58 ft. long and 30 ft. wide. When the maps are rolled out of view the company's exploration secrets are neatly concealed and the room looks like a typical paneled conference chamber.

Six roller-type maps are recessed in the walls. Each map is 20 ft. wide and is scaled to 1 in. for every mile so that each panel represents an area 240 miles wide. Length of the maps vary from 150 to 187 ft.

Printed on heavy cloth, the maps are wound on big aluminum rollers. At the touch of a button rollers start spinning slowly, revealing any particular area to be scrutinized.

DRAFTSMAN Bill Jenkins is one of four draftsmen whose job is to keep maps in Continental's new map room up to date. Any new developments in the company's world-wide search for oil are plotted on the maps.

At the end of each map is an impregnated cloth which matches the room's walnut-finish metal paneling. When not in use, maps are turned to this section to create the conference-room effect.

In planning the unusual room, Conoco officials visited some of the best map facilities in the country.

The six maps cover all territories in which Continental has leases or production, including not only the United States but Canada, Egypt, Libya, British Somaliland, and Somalia. A glance at them shows proximity of Continental acreage to any particular oil play.

Railway Wins Again

U. P. clears its oil-gas rights to land grants

DENVER.—Union Pacific Railroad has won a second law suit challenging its rights to oil and gas underlying lands granted it by the federal Government to build the line.

U.S. District Judge Waldo Rogers ruled that the railroad, and not the government, owns the oil and gas rights under the land. The ruling dismissed an action brought against the railroad by 20 Denver and Adams County residents.

The Coloradoans contend that oil and gas rights under 40,000 acres of land in eastern Adams County remained vested in the U.S. Government when the lands were given the railroad.

Other suits . . . In an earlier suit last year, the U.S. 10th Circuit Court of Appeals here rejected a government claim to oil and gas rights under U.P. right-of-way near Borie, Wyo. The railroad planned to drill on the land.

Still pending is a suit filed in state district court at Sterling, Colo., against U.P. by two Logan County landowners. They claim the oil and gas rights were transferred to the purchaser when the railroad sold the land-grant tracts 60 years ago. They argued that a U.P. rider reserving rights to coal and other minerals did not apply to oil and gas.

The case was tried in February and Judge George H. Blickhahn is due to render a decision in mid-May.

Ruling explained . . . In the latest Denver case, Judge Rogers ruled that the complaint failed to state a claim, that the court lacked jurisdiction, and that the Secretary of Interior was not within the court's jurisdiction. The 20 plaintiffs had sought unsuccessfully to obtain leases to the land from the interior secretary.

Rogers explained that his opinion had the effect of awarding oil and gas under the land-grant tracts to the railroad, provided oil and gas was discovered after the land was conveyed by the Government to the railroad. Oil and gas discovered before the conveyance, he said, belong to the Government.

Slick Reorganizes

Firm to operate holdings of famed wildcatter's family

HOUSTON. — Slick Oil Corp. has been organized here as a successor to Slick Oil Co., Ltd.

The new company, with holdings in nine states and Canada, will operate the principal oil and gas properties held by the family of the late Tom Slick, Sr., famed wildcatter of the 1920s.

President and chairman of the board is A. K. Tyson, former president of American Republics Corp. and more recently managing partner of Slick Oil Co., Ltd. Board members include Tom Slick, San Antonio; and Earl F. Slick, Winston-Salem, N. C.

Other officers of the company are Samuel E. Sims, vice president; H. K. Clarkson, secretary and chief counsel; Mrs. Myrtle Cruz, assistant secretary; and Mox S. Gardner, treasurer. Also elected to the board were Lewis J. Moorman, Jr., San Antonio; Herbert Grindal, New York and San Antonio; Theodore N. Danforth, Boston and New York; and Sims.

The company's operations are scattered through Texas, Kansas, Arkansas, Mississippi, California, Louisiana, Oklahoma, Colorado, and New Mexico. It also has oil and gas properties in Canada.

Slick Oil Co., Ltd., a limited partnership, was founded in 1954 through merger of the old Slick Oil Co., Slick-Moorman Production Co., and Geotek Oil Co. It moved its headquarters here from San Antonio last year.

Tekoil Buys Production

DALLAS.—Tekoil Corp. has purchased 30 producing oil wells in West Texas' Lehn-Apco field.

Twenty-two wells were bought from Lamphere & May and eight from Donnelly & Echols. Tekoil plans a $540,000, 27-well drilling program in the area. Water flooding also is planned in Lehn-Apco, where the company controls all but two wells.

Tekoil earlier this year purchased producing properties of Kio Oil & Development Co. and gained control of Saint Anne's Oil Production Co. through a merger.

Florida Shelf Open to Oil

WASHINGTON.—The outer Continental Shelf off the west coast of Florida was opened for geological and geophysical exploration last week by the Interior Department.

Explorations are to be limited to areas designated and approved by the geological survey's regional oil and gas supervisor. Permission to explore also must be secured from the Corps of Engineers. And operations must not scare the fish.

The department has adopted as part of its regulations rules of the Florida State Board of Conservation imposing restrictions to protect and conserve aquatic life. The U.S.G.S. supervisor is authorized to accept the assistance of the state board in enforcing these rules.

McKay Steps Down

Interior secretary leaves to run against Sen. Morse

WASHINGTON.—Interior Secretary Douglas McKay will leave government service this week to battle for the Senate seat of Democrat Wayne Morse of Oregon.

He took with him a letter of appreciation from President Eisenhower. McKay, the President said, did much to carry forward the administration's "essential programs designed to assure orderly development and wise use of our natural resources, in accord with sound conservation principles."

This effort, however, has not been completed, Eisenhower added. "While we have made significant progress in the past 3 years, much remains to be done before the aims of this administration will have been fully met," he said.

McKay, brought into the cabinet by Eisenhower in January 1953, served during the transition period when the Louisiana, Texas, and California tidelands were returned to those states and the system for oil and gas leasing of the outer Continental Shelf was set up.

McKay's Record . . . During his service, McKay was in conflict with Congress several times. His power policy, a timber lease which permitted a mining venture, and, recently his opening of the wildlife refuges for oil and gas development were frequently attacked.

McKay also brought to an end the Interior Department's long effort to develop a synthetic liquid-fuels industry. He closed the government-owned synthetic-gasoline plant at Louisiana, Mo., in April 1953. Last year he closed the shale-oil research program at Rifle, Colo.

A successor to McKay has not yet been named by the President. Early speculation centered around Gov. Dan Thornton of Colorado. More recently, Undersecretary of Interior Clarence A. Davis has been mentioned.

McKay, an automobile dealer in Salem, Ore., served as mayor of that city, state senator, and governor before coming to Washington.

Drainage Charged

Professor says Oklahoma, Texas getting Kansas gas

WICHITA.—The Kansas Corporation Commission will hold a second hearing on the question whether Oklahoma and Texas wells are draining natural gas from the Kansas portion of the Hugoton field.

The commission plans another hearing, probably at Topeka. It has heard testimony that Oklahoma and Texas wells are draining gas from the field so fast that pressures in the two states are declining twice as fast as in the Kansas section.

The testimony was given by Dr. C. F. Weinaug, director of the petroleum engineering department of the University of Kansas. He was the sole witness called at the initial commission hearing here to investigate allegations of the Southwest Kansas Royalty Owners Association against the two states.

The association contended that pipeline companies are buying most of their Hugoton gas in Oklahoma and Texas because of cheaper rates. The Kansas wellhead price, regulated by statute, is 11 cents a thousand cubic feet. Oklahoma price is 9.8262 cents and Texas' rates range from 5-7 cents.

Weinaug's testimony was challenged by Joseph Ralston, attorney for Cities Service Gas Co., as speculative and pegged on assumption. But his arguments were overruled by Harry Snyder, Jr., chairman of the commission, who then continued the hearing until a later date.

Cities Service was one of several major gas purchasing companies ordered to appear at the hearing and show cause why they should not be forced to take gas from Hugoton Field at the same rate in all three states.

FPC Plans Monthly Reports

WASHINGTON.—The Federal Power Commission announces that its opinions and decisions will be published monthly in the form of "advance sheets." The first issue, covering January 1956, will be ready for distribution in May. They will be handled under a subscription service by the Superintendent of Documents, U. S. Government Printing Office.

The monthly publications will consist of the actual pages which eventually will appear in the annual bound volumes of the FPC reports. They will include FPC opinions issued since the preceding publication, selected orders in the nature of opinions, and intermediate decisions which have become final during the month.

Israeli Stepout Hits

Offset to Heletz discovery tests at rate of 1,500 bbl. daily; wildcat northeast of discovery drilling ahead

A SECOND offset to the Heletz discovery in Israel has come in as a producer, testing at the rate of 1,500 bbl. daily.

The test, Heletz No. 2, may be better than either the discovery or Heletz No. 3, which is expected to produce 300 to 500 bbl. daily *(The Oil and Gas Journal, March 19, page 135)*.

Last week, No. 2 was drilling ahead at around 5,300 ft. while production string was being set in No. 3 at 5,000 ft. The hole was bottomed at 5,600 ft. because of limitations of the rig.

The discovery well found the first of two sands at 4,906 ft. at the top of lower Cretaceous. No. 3 offset, 1,300 ft. north and slightly east, found the sands several feet higher. No. 2 offset, 1,300 ft. south and slightly west, encountered the oil formations slightly lower. Lapidoth Israel Oil Co., Ltd., and Israel Oil Prospectors, Ltd., are drilling the wells.

A 4-mile pipeline from the discovery well to the railhead at Askalon has been completed. The line has a capacity of about 6,500 bbl. daily. Its construction was rushed in order to bring out Heletz production as quickly as it is developed.

The discovery well is now producing an even 300 bbl. daily. It has been in commercial operation since October. Output has been trucked out and processed at the Haifa refinery. So far, there has been no drop in pressure at Heletz No. 1.

Wildcat watched . . . A lot more about the extent of the producing area may be learned from Negba No. 1, a wildcat being drilled on the same Hulequat structure as the discovery about 4½ miles northeast. The well is at about 4,600 ft. When cored at 4,400 ft., formations were running parallel with Heletz. A slight saddle is believed to lie between Negba and the discovery.

Other drilling . . . In other drilling operations, Israel-Mediterranean Petroleum, Inc., and Pan-Israel Oil Co., Inc., have two wells under way in a joint project. One well is drilling below 800 ft. on Urim prospecting license about 4½ miles south of Heletz. The test, scheduled to go to 8,000 ft., is located on a gravity anomoly worked out with a core drill.

Israel-Mediterranean and Pan-Israel's second well is located in northern Israel, a stone's throw from the Haifa refinery. The test, at present below 2,000 ft., also is scheduled to go to 8,000 ft. It is located on a faulted structure. Actual drilling of the two wells in the joint project is being carried on by Parker Drilling Co. of Israel, which is an associate of Parker Drilling Co. of Tulsa.

B.P. Deal Opposed

Yemen claims Red Sea area licensed by Aden officials

THE Yemen Government is protesting a concession granted to British Petroleum Co., Ltd., covering the Kamaran Islands in the southern part of the Red Sea.

Yemen's deputy foreign minister, Mohammed el Emary, said recently in Cairo that his government plans to place the question of the concession's legality before the International Court of Justice if diplomatic talks fail to settle the matter.

D'Arcy Exploration Co., a B.P. subsidiary, obtained an exploration license covering the islands late last year from the British-administered protectorate of Aden *(The Oil and Gas Journal, January 2, 1956, page 64)*. D'Arcy Exploration has begun geological, gravity, and magnetic surveys on the main island of the group which has a 22-sq.-mile area.

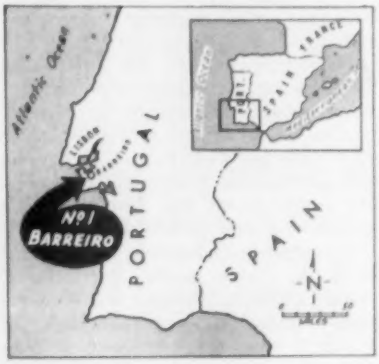
The Yemen Government insists it has a "strong claim" to the islands and regards the exploration concession as an infringement of its sovereignty.

Costa Rican Test Hits

First oil production in Central America seemed assured last week.

Reports from Costa Rica were that a drill-stem test of Union Oil Co.'s 1 Cocoles indicated commercial production from a zone below 6,500 ft.

The well is less than a mile from the Panamanian border, and the test results caused excitement in both republics.



Wildcat in Portugal

Third test is spudded near Lisbon by Socony affiliate

MOBIL EXPLORATION PORTUGAL, INC., is preparing this week to spud in its third wildcat in an exploratory program in central Portugal.

The third test, 1 Barreiro, will be drilled with a 12,000-ft. rig about 6 miles from Lisbon on the south side of the Tejo River. Mobil Exploration, a wholly owned subsidiary of Mobil Overseas Oil Co., Inc. (Socony Mobil), spotted the location of its next test last week. The company earlier revealed abandonment of a second dry hole in Portugal.

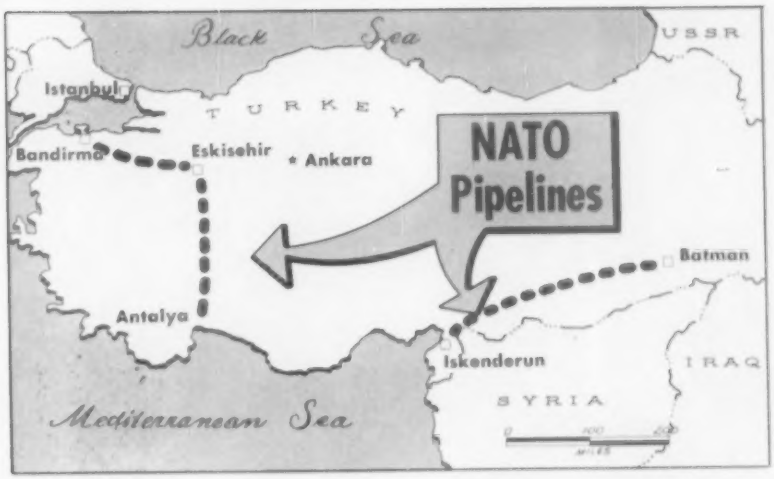
The second well, 1 Arruda, was abandoned at a total depth of 7,009 ft. just north of Vila Franca de Xira, a town about 30 miles north of Lisbon. The first test, 1 Pinhal Nova, south of the Tejo River in the same area, was abandoned at 5,531 ft. last August.

The Socony Mobil company took over the exploratory program last year under an agreement with Cia. dos Petroleos de Portugal, owned and financed by the Portuguese Government and the Axel Johnson interests of Stockholm.

Pakistan Revises Tax Policy

The Pakistan finance minister, Amjad Ali, last week revealed a new tax policy for foreign technical experts that should make working in Pakistan's infant oil industry more attractive.

The finance minister said his government will exempt from local taxation the salaries paid foreign technicians for the first 2 years they work in Pakistan. The exemption applies to any foreign technical expert employed under a contract approved by the central government of Pakistan. Presumably this would cover any oil operation in Pakistan.



NATO Starts Two More Turkish Pipelines

CONSTRUCTION has started on two more products pipelines to serve military air fields in the interior of Turkey.

The North Atlantic Treaty Organization awarded construction contracts to an Italian firm, Cia. Tecnica Internazionale (Techint), of Milan.

Both lines will terminate at Eskisehir, located about 140 miles west of Ankara in central Turkey. One line will begin at Bandirma, on the Sea of Marmara, and run southeast. The second will originate at Antalya on the Mediterranean Sea and take a route almost due north.

The 4-in. Bandirma-Eskisehir line will be 205 miles long. Techint estimated the laying cost would be about $1,400,000. The 8-in. Antalya-Eskisehir section will run 250 miles.

Another products line from Iskenderun, in southern Turkey, northeast to Batman, is being built under NATO sponsorship *(The Oil and Gas Journal, August 22, 1955, page 107)*. Associated Pipe Line Contractors, Inc., Houston, is laying 425 miles of 4, 6, and 8-in. on this project. Completion is scheduled late this year. The interior terminal of Batman is the site of a new 7,000-bbl. daily refinery which processes crude from nearby Raman field for local consumption.

Bidders are awaiting award of contracts for building 22 pump stations and 14 terminals on the pipelines. Bids were opened February 14. Bidders were Associated Pipe Line Contractors; Techint; and a syndicate of Williams Brothers Co., Costain-John Brown, Ltd., and Raymond Concrete Pile Co.

Tulsans Join Gulf in Bolivia

THREE Tulsa companies—one a major pipeline contractor—are launching their first foreign exploration venture through an interest in a Bolivian concession with Gulf Oil Corp.

A combined 20 per cent interest in Bolivian Gulf Oil Co. is held by Falcon Seaboard Drilling Co., Barry & Reiner, Inc., and Williams Brothers, builder of Bolivia's crude and products pipeline system.

Falcon Seaboard, drilling contractor and producer, and Barry & Reiner, an independent producer, each holds 7 per cent interest in Bolivian Gulf. Williams Brothers owns 6 per cent.

They will help underwrite exploration costs on the 3,750,000-acre concession taken out by Bolivian Gulf and share in any production found. Exploitation rights for 40 years may be obtained on 1,125,000 acres of the block anytime within the next 4 years *(The Oil and Gas Journal, April 2, page 91)*.

Falcon Seaboard, like Barry & Reiner, is taking part in the deal primarily to develop foreign oil production. But the contract also gives Falcon Seaboard the opportunity it has been looking for to enter foreign drilling. The company, which is running 26 rigs in the United States, is to have first option to bid on drilling contracts for Bolivian Gulf.

Williams Brothers will build the 201-mile, 8 and 10-in. crude line from Sicasica, Bolivia, to Arica on the Chilean seacoast which will give Bolivia its badly needed export outlet. The country, opened again to foreign operators this year, is producing more than 11,000 bbl. daily, some 7,000 bbl. above domestic consumption. Williams Brothers has already done preliminary engineering on the line, for which Bolivian Gulf is to provide $5,000,000 in financing.

A pipeline to move crude from southeastern fields to Sicasica also is envisioned in the deal should future production warrant its construction.

The whole agreement is subject to ratification by the Bolivian Congress. The governments of Bolivia and Chile must get together on the pipeline to the Pacific Coast.

Alky Units Slated

Japan approves units for Jersey, Dutch-Shell firms

THE Japanese Government has authorized two refiners to build alkylation units to produce avgas.

The successful applicants are Toa Nenryo Kogyo K.K., an associate of Standard Oil Co. (N. J.), and Showa Oil Co., a Royal Dutch-Shell affiliate.

Toa Nenryo will produce 1,600 bbl. daily of avgas and Showa Oil 1,200 bbl. daily. The five octane ranges will be 80, 91-98, 100-130, 108-135, and 115-145.

Output of the units will meet the needs of Japan's embryonic army and navy and two domestic airlines. Gasoline imported for refueling by 15 foreign airlines, some 550 bbl. daily, was not included.

The government expects demand to reach its peak in 1960, at around 3,200 bbl. daily, then decline in the face of rising jet-fuel consumption. Probable demand is pegged at 1,800 bbl. daily this year; 2,300 bbl. daily in 1957; 2,600 bbl. daily in 1958; and 2,900 bbl. daily in 1959.

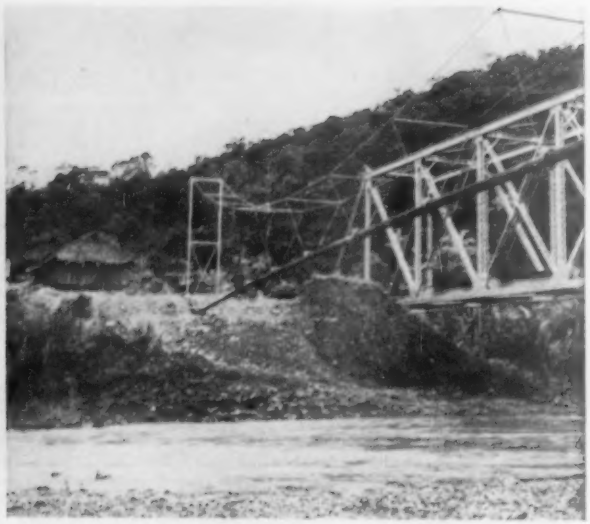
Austria Ups Oil Payments

Austria apparently is trying to pay off her crude-oil reparations to Russia in a shorter period than specified in a treaty signed little more than a year ago.

Reports from Vienna last week indicated that Austria will step up crude shipments to Russia by about 6,000 bbl. daily to more than 26,000 bbl. daily this year. Under the terms of the Austrian state treaty signed by the world powers in May 1955 and a Russo-Austrian agreement signed a month earlier, Austria agreed to ship 70,000,000 bbl. of crude to Russia over a 10-year period.

If Austria ships the additional crude to Russia at the same rate for the rest of the treaty period, her obligation will be paid off in 7½ years instead of 10.

MULE TRAIL hugging the side of mountains is reopened by pipeline crews building a 63-mile line in Colombia. The products artery links the Pacific port of Buenaventura to the prosperous Cauca Valley. Pipe for the trail section of the line was hauled in by mules. Special hand-drawn equipment was designed for bending, cleaning, and coating.



VALLEY RIVER CROSSINGS, such as this, were numerous along the new Colombian pipeline route. A series of over-water crossings spanned the Dagua River near the coast. Upstream the contractor built 11 submarine and 7 suspension-bridge crossings. The line left the river in the mountains and followed a centuries-old Spanish trail.

Colombia's 'Mule Trail Line' Operating

COLOMBIA'S rich Cauca Valley is now being supplied petroleum products by a new pipeline that snakes 63 miles over a centuries-old mountain mule trail from the Pacific port of Buenaventura.

The 6 and 8-in. line of Oleoducto del Pacifico, S. A., took nearly a year to build and represents one of the pipeline industry's toughest construction jobs.

It cost $5,400,000 to get the vital new artery built. This project is the first products pipeline in Colombia owned entirely by private capital.

A fleet of 95 to 100 tank trucks had plied the dangerous mountain highway to haul most of the 7,000 bbl. daily needed to supply industry and farms in the valley and the fast-growing city of Cali, a metropolis of 350,000.

Landslides and cave-ins continually interrupted the traffic, however. And oil needs had been growing at the rate of 100 bbl. per day each month. This was beginning to overtax the rail and truck facilities.

Rugged job . . . Terrain was one of the biggest problems faced by both the project's engineers, Pipeline Engineering Co., Dallas, headed by F. E. Warterfield, Jr., and the contractor, Williams Brothers, Tulsa.

The ground rises from sea level at Buenaventura to 2,700 ft. at Dagua in only 42 miles. It reaches 5,400 ft. in the next 4½ miles. It then drops to 4,500 ft. in a valley, rises again to

5,200 ft. before crossing the last mountain range and dropping into Cauca Valley. Its terminal is Yumbo where elevation is 3,200 ft. (See chart.)

The mountains crossed by the line are very sharp with steep sides and narrow valleys between them. Excessive rainfall over part of the route makes landslides and flooded rivers serious factors.

Engineers abandoned any idea of using the railroad or highway rights-of-way over the mountains. On both of these routes the pipeline would have to be buried almost entirely. Solution to the problem of crossing the mountains came with discovery of an old Spanish mule trail built by slave labor in the seventeenth century.

Construction . . . It took 350 days to build the line—six times longer than over normal terrain.

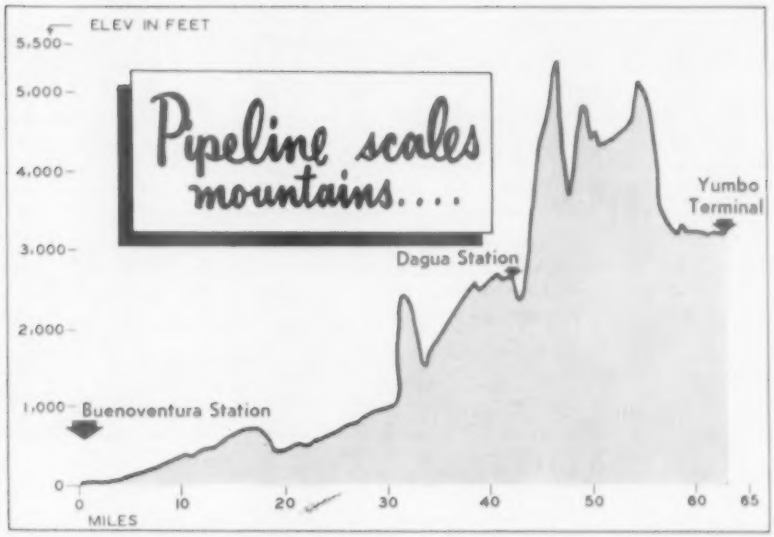
An unprecedented amount of rain —420 in. during the construction period —plagued work. Crews at times could work only a few hours a day. Landslides of unusual proportions were caused by the rains.

Most tedious part of the construction was laying pipe over a 11-km. stretch of mule trail which narrowed to 4 or 5 ft. in places.

It was impossible to get any kind of heavy equipment along the trail. Pipe, which elsewhere on the line was laid in 40-ft. joints, was cut to 20 ft. in this section so it could be packed by mules. A portable bending machine equipped with hydraulic jacks and mounted on pneumatic tires was brought to the site. In this stretch of line there were no more than 100 straight joints of pipe laid.

Welding was done with three 180-amp. Lincoln welding machines that were small enough to be moved along the line. Mobile equipment also was used to clean and wrap this section of the pipe with polyethylene tape and asbestos felt. All the light machinery was pulled along the trail by hand.

About half of the entire line is buried and the balance supported by 6,000 concrete skids manufactured at a point along the line where materials were available. Some 42 miles of the line is 8-in. pipe and 21 miles is 6-in. There are two pumping stations—one at the seaport terminal at Buenaventura and the other at Dagua. The delivery terminal at Yumbo is just outside Cali.



Both pumping stations were designed to have two 4,000-bbl. per day Aldrich variable-stroke pumps and one 12,000-bbl. per day Aldrich quintuplex fixed-stroke pump. The line has an initial capacity of 18,000 bbl. daily, but is now moving only 7,000 bbl. daily to meet present demands. In the future expansion to 45,000 bbl. daily is possible with additional equipment, a booster station and looping part of the 6-in. line from Dagua to Yumbo.

What it means . . . The line was designed to bring petroleum products to one of the most progressive areas in South America.

Immediately on opening of the line, gasoline prices dropped 1 cent. It is estimated the pipeline will save $800,000 in transportation costs annually. The products line also was designed to be expanded to meet a demand more than six times as large as present needs.

Cuba and Arabia Mapped by Air

TWO major aerial photographic mapping projects in widely separated areas of the globe are being carried out by a Philadelphia firm that has pioneered this service for the oil industry.

In Cuba, a 35,823-sq.-mile area of both land and sea is being photo-mapped and surveyed by airborne magnetometer. Half a world away in Saudi Arabia, a photo-mapping project is covering more than 200,000 sq. miles. Both jobs are being done by Aero Service Corp.

In Cuba . . . Aero Service is surveying a large area of the Caribbean island for Cuban Stanolind Oil Co.

The first portion of the job, the actual photographing of the Stanolind concession, was completed last month. The magnetometer survey of more than 23,000 sq. miles of land area and more than 12,000 sq. miles of ocean will be finished by the end of May.

The aerial mapping was done by two modified P-38 aircraft flying at 32,000 ft. Each 9 by 9-in. photo covers about 80 sq. miles. The magnetometer survey is being carried out from a slower, twin-engined Beechcraft flying at about 1,000 ft. over a series of gridded lines spaced 2 miles apart.

In Saudi Arabia . . . Nearly one-fourth of Saudi Arabia is being photo-mapped for the Saudi Government by Aero Service Corp. There is no magnetometer survey involved.

The entire job will cover 200,000 sq. miles. Last week the converted B-17 being used for the mapping had completed nearly 65,000 miles of the area. The desert mapping will have to be halted in April because seasonal cloud formations will make further photographing impossible until September.

The big plane flies at 225 miles an hour and takes a photograph a minute. The 9 by 9-in. exposures cover about 80 sq. miles and they will overlap like shingles so that geologists and engineers can use them stereoscopically.

The photo plane is kept on course as it flies over grids of the Arabian desert by four Shoran stations set up in the desert. The ground stations are shifted from time to time to form an electronic trilateration network as the plane moves from one block to another.

Italy Changes Mind

● Government studying new plan for corridors around concessions

BACKERS of a private oil industry for Italy apparently scored another minor triumph last week in their efforts to develop a petroleum law acceptable to foreign oil companies. They still have a long way to go.

Another provision of the proposed Italian oil legislation that would favor the government oil agency, Ente Nazionale Idrocarburi (E.N.I.) over private companies has been discarded—at least for the present. The move came just a week after the government nominally abandoned the proposed 60-40 profit split *(The Oil and Gas Journal, April 2, page 90)*.

Aside from the 60-40 split, one of the most controversial points in the long-debated legislation has been the 1-km. corridor surrounding any development concession. Supporters of E.N.I. have insisted that this corridor be reserved to the government agency.

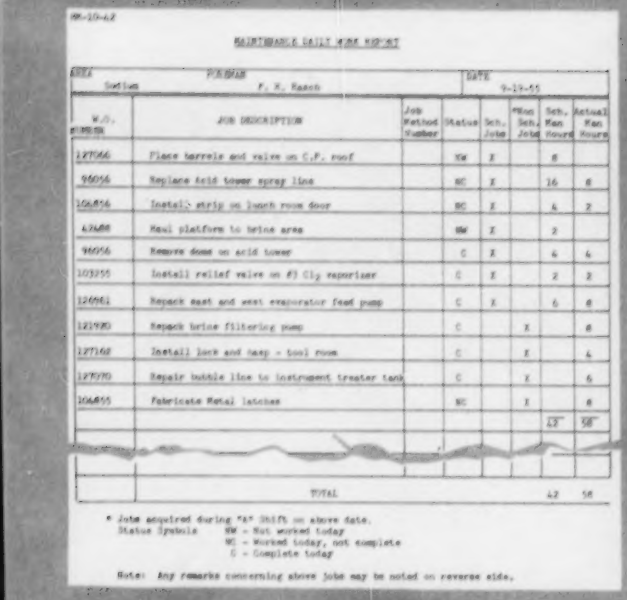
Last week the Chamber of Deputies commission on industry recommended that Parliament write its law so that this corridor could go to the highest bidder or be granted outright to any company. The move was an absolute reversal of previous thinking in studies made of the oil bill by Italian political circles.

Sliding royalty scale . . . The commission which just completed its study of the proposed oil bill also modified the royalty scale proposed by the Italian Minister for Industry and Commerce, but the new scale is still regarded as much too high by oil company observers.

The commission recommended that the royalty scale range from 2½ per cent on production of less than 30 bbl. daily up to 22 per cent of production of 1,900 bbl. daily or more. This royalty would be in addition to all other taxes an oil company would be required to pay in Italy.

The high royalty on bigger production, plus income and other taxes required under Italy's fiscal laws, could still give the government a bigger share of an oil company's profit than the company could keep.

Spokesmen for companies interested in Italy's oil development said last week that the obvious answer to this situation would be a definite ceiling written into the law covering both royalties and other taxes. They frankly were not too optimistic about obtaining such a provision in the law.

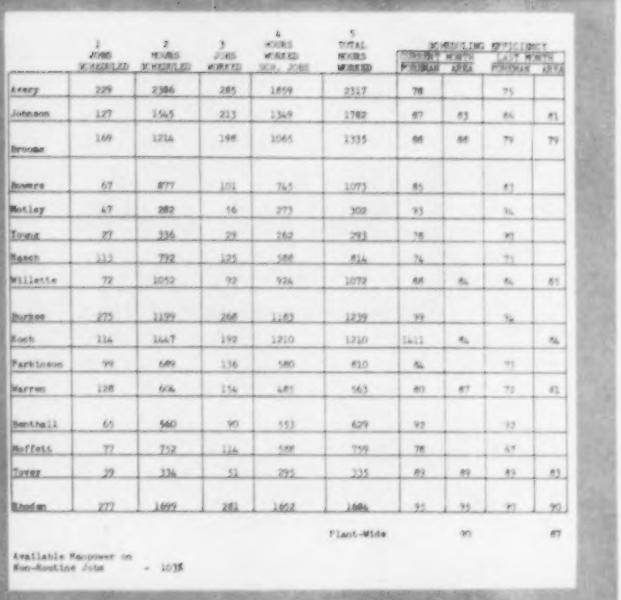


MAINTENANCE DAILY WORK REPORT

W.O. Number	Job Description	Job Method Number	Status	Sch. Jobs	Mins Sch. Jobs	Sch. Man Hours	Actual Man Hours
127066	Place barrels and valve on C.P. roof		NW	X		8	
96056	Replace acid tower spray line		NC	X		16	8
106856	Install strip on lunch room door		NC	X		4	2
47688	Haul platform to brine area		NW	X		2	
96056	Remove dome on acid tower		C	X		4	4
103255	Install relief valve on #3 Cl_2 reporizer		C	X		2	2
126961	Repack east and west evaporator feed pump		C	X		6	8
121980	Repack brine filtering pump		C		X		8
127162	Install lock and hasp - tool room		C		X		4
127070	Repair bubble line to instrument treater tank		C		X		6
106855	Fabricate Metal latches		NC		X		8
						42	56
	TOTAL					42	56

* Jobs acquired during "A" Shift on above date.
Status Symbols NW - Not worked today
NC - Worked today, not complete
C - Complete today

Note: Any remarks concerning above jobs may be noted on reverse side.



	1 Jobs Scheduled	2 Hours Scheduled	3 Jobs Worked	4 Hours Worked Sch. Jobs	5 Total Hours Worked	Scheduling Efficiency Current Month Percent	Area	Last Month Percent	Area
Avery	229	2386	285	1859	2317	78		75	
Johnson	127	1565	213	1349	1782	87	83	86	81
Brooks	169	1216	198	1065	1335	88	88	79	79
Bowers	67	877	101	745	1073	85		83	
Motley	47	282	56	273	302	93		94	
Tonga	27	336	29	262	293	78		89	
Roach	113	792	125	588	814	74		73	
Willette	72	1052	92	926	1072	88	84	84	83
Durbee	275	1139	268	1183	1239	99		94	
Koch	114	1447	192	1210	1210	1411	84		84
Parkinson	99	689	136	580	810	84		71	
Warren	128	606	154	481	563	80	87	72	81
Bentsall	65	560	90	553	629	92		92	
Moffett	77	752	114	588	799	78		67	
Tyrer	39	334	51	295	335	89	89	83	83
Rhoden	277	1699	281	1652	1684	95	95	91	90
						Plant-Wide	90		87

Available Manpower on Non-Routine Jobs - 1038

DAILY WORK REPORT prepared by the foreman at the end of each day. Fig. 1.

MAINTENANCE CLERK uses daily scheduling sheets to prepare this weekly report. Fig. 2.

How Ethyl Keeps Rein on Upkeep Costs

These are the forms that ride herd on controls

by Larry Resen
District Editor

Part 1

AT Ethyl Corp.'s Houston plant an extensive maintenance program has developed during the 4 years the plant has been in operation.

Starting out with a completely new installation in April 1952, plant management immediately began stressing preventive maintenance as the long-range means to lower costs and improve plant efficiency.

As plant operation time accumulated, maintenance work increased. The Ethyl group then set up the present detailed program, based to some extent on methods used at the Baton Rouge plant.

Job schedule . . . Perhaps one of the biggest difficulties is the efficient scheduling of the crafts. Ethyl has set up a procedure which is designed to keep foreman, area supervisors, and other members of the line organization posted on work being done, jobs completed, and jobs to be done. Time necessary for each job is estimated and a running check kept on the hours actually required.

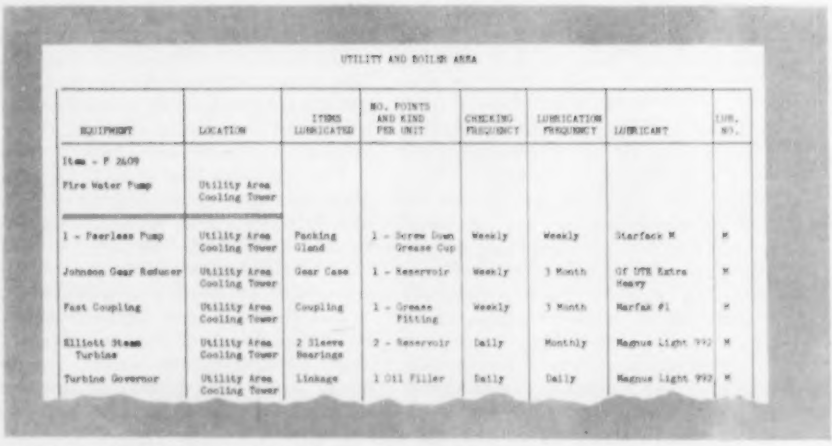
At the same time the time spent on unscheduled jobs — those which come up during the day shift is noted. By figuring the hours worked on scheduled jobs against the total hours worked, an efficiency percentage is calculated. This efficiency percentage is then attacked by analyzing ways to make it equal to the theoretical 100. One way is to better anticipate the unscheduled jobs which crop up, so that they may be scheduled. Another is to get a closer estimate on the time necessary to perform a repetitive job, such as replacing a valve, dismantling a pump, pulling a tube bundle, etc.

PETROCHEMICALS

Job Scheduling

Here in outline form is the procedure for setting the job schedules:

- Near the end of each day every



UTILITY AND BOILER AREA

Equipment	Location	Items Lubricated	No. Points and Kind per Unit	Checking Frequency	Lubrication Frequency	Lubricant	Lub. No.
Item - P 2609							
Fire Water Pump	Utility Area Cooling Tower						
1 - Peerless Pump	Utility Area Cooling Tower	Packing Gland	1 - Screw Down Grease Cup	Weekly	Weekly	Starfack M	M
Johnson Gear Reducer	Utility Area Cooling Tower	Gear Case	1 - Reservoir	Weekly	3 Month	Of DTE Extra Heavy	M
Fast Coupling	Utility Area Cooling Tower	Coupling	1 - Grease Fitting	Weekly	3 Month	Marfak #1	M
Elliott Steam Turbine	Utility Area Cooling Tower	2 Sleeve Bearings	2 - Reservoir	Daily	Monthly	Magnus Light 990	M
Turbine Governor	Utility Area Cooling Tower	Linkage	1 Oil Filler	Daily	Daily	Magnus Light 990	M

MASTER SCHEDULE lists lubrication requirements for all equipment by areas. Fig. 3.

HM-10-103

LUBRICATION SCHEDULE
Houston Plant

Legend: C-check; L-Lubricate
(Note unusual conditions on back of this page)

Equipment and Location	Points to Lubricate Each Unit	Lubricant	1st Week	2nd Week	3rd Week	4th Week	5th Week
Item CT-2401							
Cooling Tower							
(Utility Area)							
Marley Reduction Gears	1 Gear Case	Mobilube GX-90	L	C	C	C	
Item P-2403							
Fire Water Pump							
(Cooling Tower)							
Peerless Pump	1 Packing Gland	Starfax M	L	L	L	L	
Item P-2409							
Fire Water Pump							
(Cooling Tower)							
Peerless Pump	1 Packing Gland	Starfax M	L	L	L	L	
Coupling	1 Coupling	Marfax #1	C	C	C	C	
Elliott Steam Turbine	2 Bearings	Magnus Light 992	L C C C C	C C C C C	C C C C C	C C C C C	
Turbine Governor	Linkage	Magnus Light 992	L L L L L	L L L L L	L L L L L	L L L L L	
Spicer Coupling	2 Universal Joints	Starfax M	L	L	L	L	
Johnson Reduction Gear	1 Gear Case	Gg DTE Extra Heavy	L	C	C	C	

LUBRICATION CHECKOFF SHEET is used to keep track of the items lubricated or checked. Fig. 4.

foreman prepares a daily work report (Fig. 1) which shows:

1. A description of each job expected to be worked on the next day(s).
2. Work-over number for each job.
3. The job method number, if any, for each job listed.
4. The estimated number of hours to be worked on each scheduled job.
5. A check in the "scheduled jobs" column.

● During the following day, each foreman lists below the scheduled jobs any jobs worked on which were not scheduled. On the nonscheduled jobs the following is shown:

1. A description of each job.
2. A check in the "nonscheduled jobs" column.
3. The work-over number for each job listed.
4. The job method number, if any, for each job listed.

● In the afternoon when making out service cards, each foreman fills in the following on the form for that day:

1. Actual man-hours spent on each job listed; scheduled or nonscheduled.
2. The status of each job: (a) not worked on; (b) worked on, but not complete; or (c) complete.

● Each morning the forms for the previous day are sent to the assistant supervisor through the line organization. Each member of the line organization reviews the forms in order to be familiar with jobs which were performed.

● The maintenance clerk uses the daily scheduling sheets to prepare a weekly report (Fig. 2) which shows the following:

1. Number of jobs scheduled for each foreman and area.

HM-10-59
(Rev 11/54)

SERVICE CHECK AND MINOR REPAIRS - CRANES
Houston Plant

File No. II-8

Mechanic _____ Date _____

Assembly or Operation \ Equipment Number																
Lubrication																
Rigging and Cables																
Engine																
Clutches and Brakes																
Tracks or Wheels																
Gears																
Cooling System																
Center Pin and Rollers																

Remarks: _____

SERVICE CHECK used for cranes. Fig. 5.

2. Number of hours scheduled for each foreman and area.
3. Total number of jobs worked (scheduled and nonscheduled) for each foreman and area.
4. Actual hours worked on scheduled jobs for each foreman and area.
5. Total hours worked (scheduled and nonscheduled) for each foreman and area.
6. Scheduling efficiency for each foreman and area.

$$\text{S.E.} = \frac{\text{No. 4}}{\text{No. 5}} \times 100$$

7. Scheduling efficiency for maintenance group = Total scheduled hours worked × 100. Total hours worked (sked and nonsked).

Fig. 2 shows plant-wide efficiencies to 87 and 90 per cent for the 2 months covered by the report.

Lubrication . . . The all-important matter of lubrication is handled by drawing up forms to insure the application of the proper lubricant at the proper place with the proper frequency. A master lubrication schedule lists all equipment that requires lubrication, by areas (Fig. 3).

The master schedule lists the following:

1. Equipment by number and name.

IM-10-134 MOBILE EQUIPMENT SERVICE SCHEDULE
Houston Plant

Day	1st Week No.	Area	Equipment	2nd Week No.	Area	Equipment	3rd Week No.	Area	Equipment	4th Week No.	Area	Equipment
MONDAY	1	Na	Auto. Trans.	1	Na	Auto. Trans.	1	Na	Auto Trans.	1	Na	Auto. Trans.
	1	TEL	Auto. Trans.	1	TEL	Auto. Trans.	1	TEL	AUto. Trans.	1	TEL	Auto. Trans.
	1	TEL	Hand Lift	1	TEL	Hand Lift	1	TEL	Hand Lift	1	TEL	Hand Lift
	1	Gen	Weld. Mach.	1	Str	Towmotor			Truck	1	Str	Towmotor
			Truck	2	Str	Towmotor				2	Str	Towmotor
		Gen	Tractor	4	Str	Towmotor	9	Gen	St. swp.	4	Str	Towmotor
				5	Gen	Towmotor				5	Gen	Towmotor
				2	Gen	Weld Mach						Truck
TUESDAY	2	Na	Auto. Trans.	2	Na	Auto. Trans.	2	Na	Auto. Trans.	2	Na	Auto. Trans.
	2	TEL	Auto. Trans.	2	TEL	Auto. Trans.	2	TEL	Auto. Trans.	2	TEL	Auto. Trans.
	2	TEL	Hand Lift	2	TEL	Hand Lift	2	TEL	Hand Lift	2	TEL	Hand Lift
		Str	45T Loco.		Str.	23T Loco.		Str.	45T Loco.		Str.	23T Loco.
	1	Gen	Scooter	1	Gen	Scooter	1	Gen	Scooter	1	Gen	Scooter

SHELL & TUBE EQUIPMENT

Bundle Wt. - 6000 lb.
X-Ray - Spot
S.R. - No

Equipment	No.	Drawing	Location	Manufacturer	Materials: Header	Shell	Tubes	Tube Sheets
BBC Reactor Cooler	E-103	H-1870-AB-68	BBC Area	C. F. Braun	Steel & Monel	Steel	Monel	Monel (5/8" Clad)

Media: Shell	Tubes	Operating Data: Shell Temp. Press.	Tube Temp. Press.	Design Press.	Design Temp.	Test Press.	Tubes: Number	Size	No. Passes: Heating Surface	Corr. Allow.
Gas	Cooling Water	145°	75°					1" OD 14 BWG		1/8" None

Date	Inspector	Remarks
1-3-52	W.L.J.	Hydrostatic test on both shell & tube side @ 225 psig. Approved after reassembling the tubes.
12-20-52	E.P.R.	Removed channel cover. Air corrosion of gasket. Worn on inlet.
5-16-55	W.L.	Removed both covers. Slight turbulation of tubes. An occasional of tubes on inlet water. 75% of inlet ends of the bundle found affected. Bundle was pulled & washed.

MOBILE EQUIPMENT service schedule (at top). Fig. 6.
RECORD CARD for pressure vessels (at bottom). Fig. 7.

2. Plant location.

3. Items to be lubricated: (a) coupling, (b) gear case, (c) kind of bearings, and (d) linkage if any.

4. Number of points and kind per unit.

5. Checking frequency (daily, weekly, etc.).

6. Lubrication frequency (daily, weekly, etc.).

7. Lubricant to be used by name.

8. Lubricated by what craft.

This schedule provides a ready reference for the lubricator if any question arises.

A lubrication checkoff sheet is used so the lubricator can keep track of the items lubricated or checked (Fig. 4). This sheet is turned in to the area foreman. The equipment is spot checked periodically by this method to see if the proper lubricant is being used.

The system has been in effect for approximately 3½ years. The schedule has been revised from time to time whenever a change was needed.

Preventive maintenance . . . Forms are also a necessary part of this program, and Ethyl uses them to fit particular needs. Two typical ones are Figs. 5 and 6.

Fig. 5 shows the service check sheet used for cranes. Forms of this type are used as a guide by the craftsman making the service check. As the inspection is made, minor repairs are made, and if any major repairs or irregularities are found, they are noted on the bottom of the check sheet.

Once the check sheets are filled out and signed they are given to the area foreman for his signature, posted on a master schedule sheet as having been performed, and then filed.

Fig. 6 shows the mobile-equipment service schedule. By listing all of the equipment and then providing definite monthly time for routine check, none of the many items will be overlooked or neglected. Each maintenance area has a master schedule of service checks to be performed. These schedules are posted daily.

Pressure equipment . . . All of the vessels, stacks, and relief valves are scheduled for inspection at 1 to 5-year intervals, depending on the particular service. The stacks are scheduled for inspection every 2 years while the relief-valve inspection period varies from 3-12 months, again depending on particular service.

Inspection of this equipment is scheduled by the inspection group. This group keeps a record card (Fig. 7) for each individual piece of equipment. This card shows a record of each inspection and any significant facts relating to the inspection. Each month the inspection group issues a schedule listing the proposed inspections to be made the following month. A typical inspection report is shown in Fig. 8.

In the inspection of a heat exchanger, the tube bundle is removed from the shell and cleaned. The tube bundle is checked for any tubes that may need oiling. If any are found, the tubes are rolled and the tube bundle is inserted in the shell. When all preparations are completed for the testing, the inspection group is called.

The exchanger is hydrostatically tested, both tube and shell side, at 1.5 times the operating pressure. This procedure holds true for all inspections with one exception; if any equipment is in a service that must be water-free, the test is made at 1.5 times the working pressure with nitrogen.

Equipment record . . . A maintenance history record card (Fig. 9) is kept on file in the maintenance area supervisor's office. This file contains the complete history of all equipment within the supervisor's area.

The history of the equipment is accumulated by use of an equipment repair form.

The supervisor reviews the equipment history record file from time to time to determine whether or not the equipment is performing as it should. If a particular piece of equipment requires too much maintenance, this fact readily stands out on the card. The supervisor then investigates as to why the equipment is failing and the difficulty is remedied. This may be accomplished by recommending a change in the operating procedure, using new materials, or changing the design.

This system has been very beneficial in many instances. One in particular involved the malfunction of a gear-reduction unit. The unit was redesigned and maintenance has been practically nil since the change. Another case involves shafts failing in the hydrogen chloride unit compressors. These shafts had to be changed out entirely too often because they were being scored by the packing. One of the scrapped shafts was turned down and chrome-plated. Upon inspection it lasted for a year and now all shafts in this service are chrome-plated.

Mechanical seals . . . Shortly after the startup of the plant, considerable trouble was encountered with mechanical seals on gear-reduction units that were subjected to reversing action. These seals acted only as an oil seal and were not under pressure. The seal consisted of the conventional rotary unit with a Stellite face against a carbon wear-ring insert. The difficulty was that the face of the carbon insert chipped off, and the seal was lost.

Several different types of materials were tried as a substitute for the carbon insert without success. Finally a type of material, known as bronzoid was tested and it proved very satisfactory. At the present time, all wear ring inserts are being replaced with bronzoid in units having a reversing action. These seals vary in size from 2-in. to 6-in.

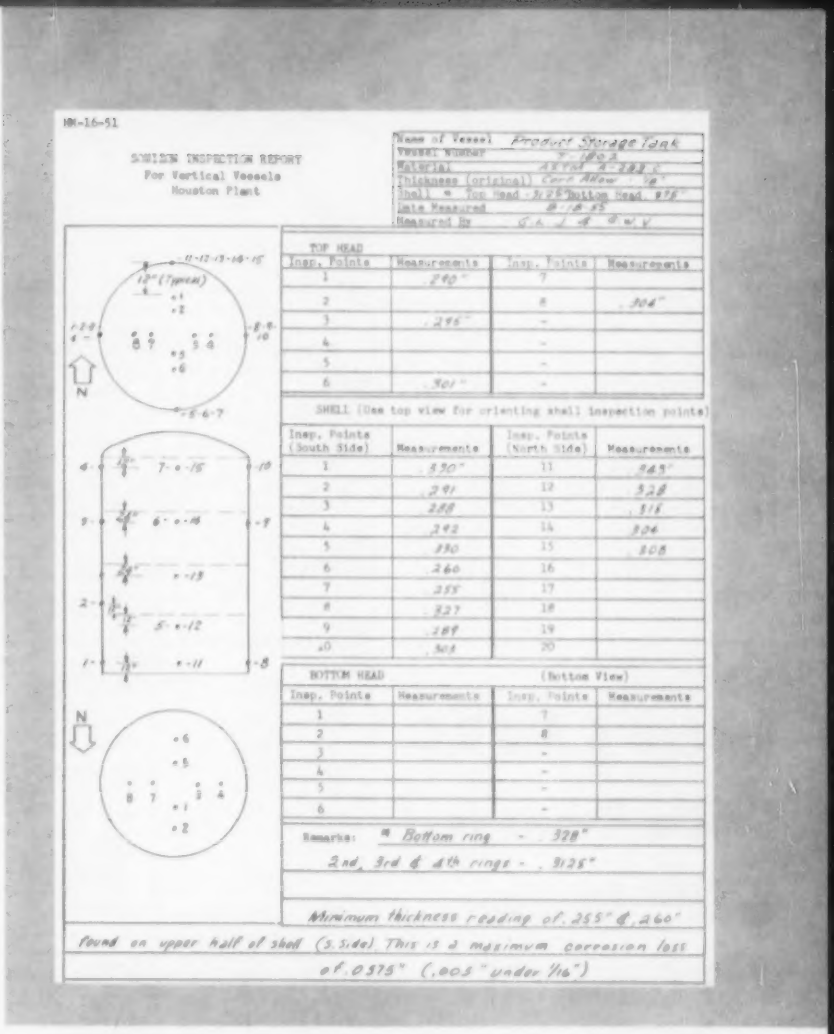
Mechanical seals also gave trouble on acid pumps. Actually, the trouble was the shaft sleeve. The sleeves were made of 316 stainless, which failed after a short time. Sleeves coated with Colmonoy are now being used, and they have proved very satisfactory.

Painting . . . The paint problem at the plant varies according to the nature of the operations in a particular area. Some problems have been solved by use of the Harvey system. This consists of sandblasting all steel after fabrication and before erection. Then the metal is coated with a primer coat of paint immediately following sandblasting or during the same day. After erection, the primer coat is touched up in marred places and an intermediate coat is applied. After 24 hours' drying time two finish coats are applied, 24 hours apart.

In areas of moderate to severe conditions a vinyl system of protective coating is used. In other areas a chlorinated rubber system of protective coating is used. These finishes have worked very well in practically all areas and the finish can be expected to last approximately 14-18 months before another finish coat is applied.

Experiments are under way on a small scale with a rust inhibitor that combines with the oxides to form a nonoxidizing film which can be painted. If this experimentation proves satisfactory it will solve the problem in very corrosive areas.

Scotch wrap is being applied on all pipe not under cover in the plant. There are limitations to the temperature range in which the tape is useful. The temperature limits are 30°-120° F. From experiments with this tape, life expectancy is 10 years. The tape application cost is about the same as the painting of new pipe with the four-coat application.



HN-16-51

SHELL INSPECTION REPORT
For Vertical Vessels
Houston Plant

Name of Vessel: Product Storage Tank
Vessel Number: T-1003
Material: A5TM A-283 C
Thickness (original) Cert Allow: 1/4"
Shell = Top Head = 5/16" Bottom Head: 5/16"
Date Measured: 8-18-55
Measured By: G. A. J. & D. W. V.

TOP HEAD

Insp. Points	Measurements	Insp. Points	Measurements
1	.290"	7	
2		8	.304"
3	.295"	-	
4		-	
5		-	
6	.301"	-	

SHELL (Use top view for orienting shell inspection points)

Insp. Points (South Side)	Measurements	Insp. Points (North Side)	Measurements
1	.330"	11	.345"
2	.291	12	.328
3	.288	13	.318
4	.292	14	.304
5	.290	15	.308
6	.260	16	
7	.255	17	
8	.327	18	
9	.289	19	
10	.308	20	

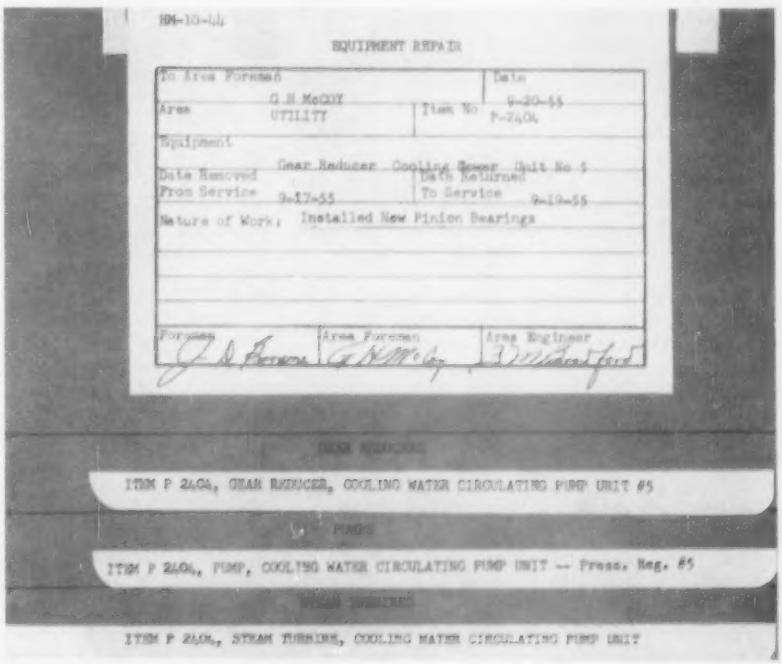
BOTTOM HEAD (Bottom View)

Insp. Points	Measurements	Insp. Points	Measurements
1		7	
2		8	
3		-	
4		-	
5		-	
6		-	

Remarks: * Bottom ring - .328"
2nd, 3rd & 4th rings - .3125"

Minimum thickness reading of .255" & .260"
found on upper half of shell (S. Side). This is a maximum corrosion loss
of .0375" (.005" under 1/16")

TYPICAL INSPECTION REPORT made monthly on pressure equipment. **Fig. 8.**



HN-10-44

EQUIPMENT REPAIR

To Area Foreman: G. H. McCOY		Date: 9-20-55	
Area: UTILITY	Item No: P-2404		
Equipment: Gear Reducer Cooling Tower Unit No 5			
Date Removed From Service: 9-17-55	Date Returned To Service: 9-19-55		
Nature of Work: Installed New Pinion Bearings			
Foreman: J. D. Brown	Area Foreman: G. H. McCoy	Area Engineer: W. Mitchell Ford	

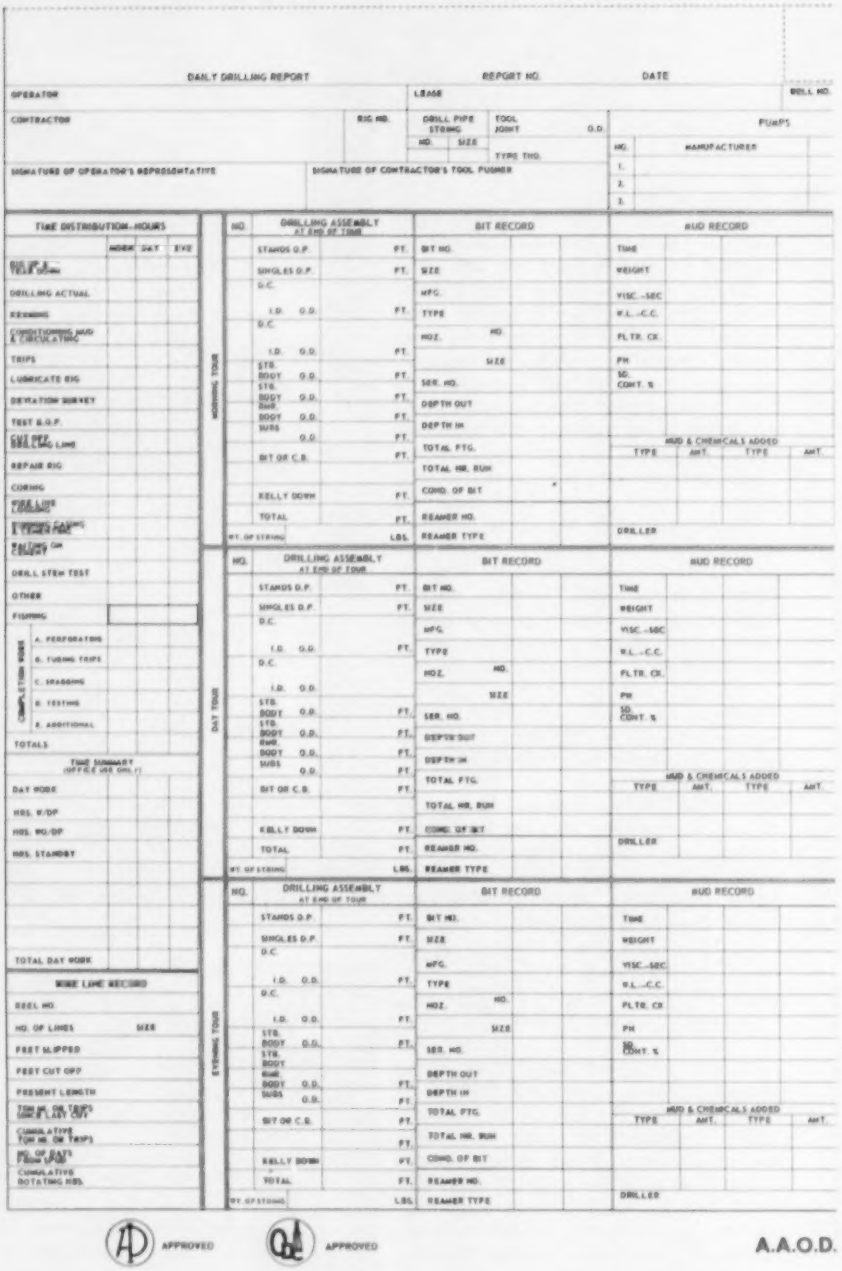
ITEM P 2404, GEAR REDUCER, COOLING WATER CIRCULATING PUMP UNIT #5

ITEM P 2404, PUMP, COOLING WATER CIRCULATING PUMP UNIT -- Press. Reg. #5

ITEM P 2404, STEAM TURBINE, COOLING WATER CIRCULATING PUMP UNIT

MAINTENANCE HISTORY record card is kept on all equipment in the area supervisor's office. **Fig. 9.**

Revised A.A.O.D.C. Drilling Report to Benefit Operators And Contractors



DAILY DRILLING REPORT — REPORT NO. — DATE

OPERATOR — LEASE — WELL NO.

CONTRACTOR — RIG NO. — DRILL PIPE STRING: NO. SIZE — TOOL JOINT O.D. — TYPE THD. — PUMPS: NO. MANUFACTURER 1. 2. 3.

SIGNATURE OF OPERATOR'S REPRESENTATIVE — SIGNATURE OF CONTRACTOR'S TOOL PUSHER

TIME DISTRIBUTION—HOURS: WORK DAY | DAY | EVE

DRILLING ACTUAL
REAMING
CONDITIONING MUD & CIRCULATING
TRIPS
LUBRICATE RIG
DEVIATION SURVEY
TEST B.O.P.
CUT OFF DRLG. LINE
REPAIR RIG
CORING
WIRE LINE LOGGING
RUNNING CASING & CEMENTING
WAITING ON CEMENT
DRILL STEM TEST
OTHER
FISHING
COMPLETION WORK: A. PERFORATING; B. TUBING TRIPS; C. SWABBING; D. TESTING; E. ADDITIONAL
TOTALS

TIME SUMMARY (OFFICE USE ONLY): DAY WORK; HRS. R/DP; HRS. RG/DP; HRS. STANDBY; TOTAL DAY WORK

WIRE LINE RECORD: REEL NO.; NO. OF LINES; SIZE; FEET SLIPPED; FEET CUT OFF; PRESENT LENGTH; TON MI. OR TRIPS LAST SLIP & CUT OFF; CUMULATIVE TON MI. OR TRIPS; NO. OF DAYS FROM SPUD; CUMULATIVE ROTATING HRS.

MORNING TOUR / DAY TOUR / EVENING TOUR

NO. — DRILLING ASSEMBLY AT END OF TOUR: STANDS D.P. FT.; SINGLES D.P. FT.; D.C. I.D. O.D. FT.; D.C. I.D. O.D. FT.; STB. BODY O.D. FT.; STB. BODY O.D. RWB. FT.; BODY O.D. SUBS O.D. FT.; BIT OR C.B. FT.; KELLY DOWN FT.; TOTAL FT.; WT. OF STRING LBS.

BIT RECORD: BIT NO.; SIZE; MFG.; TYPE; NOZ. NO. SIZE; SER. NO.; DEPTH OUT; DEPTH IN; TOTAL FTG.; TOTAL HR. RUN; COND. OF BIT; REAMER NO.; REAMER TYPE

MUD RECORD: TIME; WEIGHT; VISC.-SEC; W.L.-C.C.; FLTR. CK.; PH; SD. CONT. %; MUD & CHEMICALS ADDED: TYPE AMT. TYPE AMT.; DRILLER

AP APPROVED — A.A.O.D.C. APPROVED — A.A.O.D.

WITH the recent approval of the General Committee of the American Petroleum Institute's Division of Production a drilling-report form similar to the old Daily Drilling Report Form of the American Association of Oilwell Drilling Contractors will now be the official record of the drilling operation.

This form, which now carries the monogram of approval of both A.P.I. and A.A.O.D.C. is a revised version of the report form that has been used for nearly 2 years. Its benefit to contractors and operators will be:

- **Save driller's time** because he will have one instead of two forms to fill out.
- **Eliminate errors** which occur during the filling out of two forms and lead to controversies between operator and contractor.
- **Provide more complete** and accurate information since all drillers will have to be familiar with only one form regardless of the contractor for whom they are working.
- **Yield standardized information** which will allow better analysis of drilling operations.

How it came about . . . Committees of both A.A.O.D.C. and A.P.I. have put in about 4 years of work on the form. Both groups started committee work about the same time. To avoid duplication of effort, however, the A.P.I. committee became inactive.

The form was developed in initial form by a subcommittee of A.A.O.D.C. rotary drilling committee headed by Earle C. Hellums, of Gracey and Hllums Corp. The board of directors of A.A.O.D.C. approved it in 1953 and the general committee of the A.P.I. approved tentatively in February 1954 *(The Oil and Gas Journal, May 15, 1954, page 110)*.

The form was reviewed by an A.P.I. committee headed by Bill Duncan, drilling and production manager of Houston Oil Co. of Texas, and by the Hel-

DRILLING

C--A.P.I. OFFICIAL DAILY DRILLING REPORT FORM

APPROVED APPROVED

lums-headed A.A.O.D.C. committee about a year and a half after it was first placed in use. More than 350,000 copies of the form were ordered and used during this 18-month period.

The two committes working jointly revised some parts of the form and developed the present version.

Changes made . . . One of the major criticisms of the initial form was made by accounting departments of drilling and operating companies that there was too little space for time breakdowns to facilitate invoicing and invoice checking.

This one was cured by simply reruling the "Remarks" section and rearranging the "Time Distribution" and "Time Summary" sections.

Two more changes were made to increase the value of the engineering data. The portion dealing with casing and liner data was streamlined to obtain clearer data—with amount and type of cement to be written in the "Remarks" box. The "Mud Record" was moved to the left-hand side of the form next to the "Drilling Assembly" and "Bit Record" in an effort to condense this information and provide a better opportunity for study of factors affecting penetration rates.

The revised form, as in the past, will be published by the A.A.O.D.C. in Dallas. Price will remain the same. The form will be printed in units of an original and three one-time carbons, with 32 units to a book. Inquiries as to the availability of the form should be addressed to Philip C. Blackburn, A.A.O.D.C., 321 Insuromedic Life Building, 505 North Ervay, Dallas.

ELEMENTS OF FIELD PROCESSING—13

How Dust Filters Function

by Dr. John M. Campbell

NO discussion of mist and dust removal is complete without at least some mention of filtration. This is more often a pipeline, rather than a lease, application but the problem presented is at least partially of lease origin.

A filter differs from the mesh-type mist extractor in that the element is composed of rather densely packed woven elements that trap particles on the face of the pad as compared to the rather loosely woven metallic elements discussed in Part 10. The close clearance between the fibers allows the gas to pass while the larger particles build up on the surface and to some degree in the bed of the filter itself.

Materials . . . A number of materials have been used, including glass fiber, Dynel, felt, and similar materials that may be readily woven, or compacted, and formed into pads.

The primary use thus far has been for the elimination of dust in lines. One of the earliest applications was a "bag filter" downstream from dry-desiccant dehydration plants which, as the name implies, was primarily a porous woven bag held in place in the line. This rather crude attempt at dust separation was often more of nuisance than engineering value. As a cake of dust built up, the pressure drop became excessive and the bags often failed. Furthermore, the line had to be shut down periodically to permit cleanning of these filters.

The author is with department of petroleum engineering, University of Oklahoma, Norman.

Felt, compressed into pads, has also been used. The most successful applications had several layers of felt pads held in compression with the pads being placed parallel to the flow. All of these materials, however, were difficult to clean and tended to deteriorate under the action of the gas, particularly in the presence of liquids.

Part of this disadvantage has been overcome by the use of synthetic materials, such as glass fiber, which are more impervious to organic liquids.

Problem of liquids . . . Even with these materials, though, liquid separation appears low even though dust may be efficiently separated. Liquid particles appear to agglomerate on the downstream side of the pads as a solid film of liquid. As the gas passes through this film, bubbles are formed, burst, and are reentrained. At this point the problem is the same as the original one except that the dust is gone, and the liquid particles are larger and may be easier to catch in a conventional mist extractor. Observations such as this have led to the conclusion that the best system might well consist of a scrubber with both filter and mist extractor elements.

Desired properties . . . A filter element should ideally have the following characteristics:

1. Be self-cleaning to minimize down time.

FIELD PROCESSING

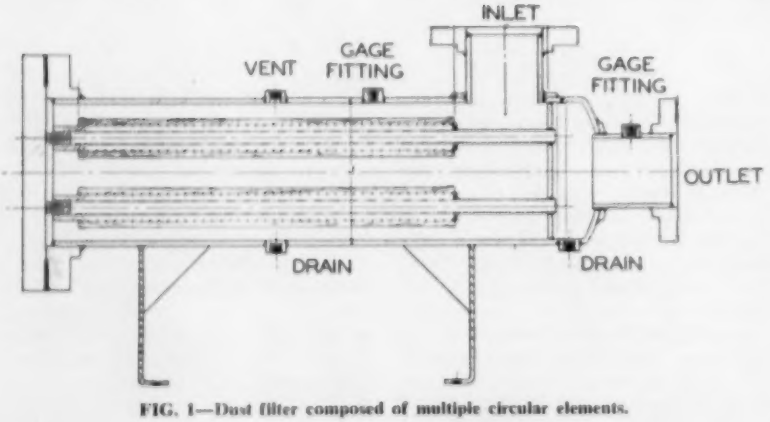


FIG. 1—Dust filter composed of multiple circular elements.

2. Be readily removable for cleaning.
3. Be impervious to the action of organic liquids and water so that it does not swell or break down.
4. Have structural strength and be rigid enough to hold its shape.
5. Have a relatively low-pressure drop.
6. Have a surface that is "nonwetted" by the liquids encountered to prevent the liquid from "crawling" through the element.
7. Be so mounted that scale, drilling mud, and other large contaminants encountered are separated prior to the gas passing through the pad.
8. Be able to separate dust and liquid simultaneously with high efficiency.

Needless to say, the above animal is not in captivity. Many filters used have worked excellently in one location and given poor results in another. The results obtained with a given field installation are often difficult, if not impossible, to evaluate. After installation of a given filter a previous problem sometimes disappears, but one is never certain whether the filter or one or more other changes in the system is responsible. This undoubtedly accounts in part for the erratic results obtained.

Field type . . . Fig. 1 shows one type of commercial filter available on the market. It is composed of multiple circular elements, the number depending on the area needed. The gas flows into the top of the filter, through the elements, and out through the tubes. Dust is retained in the element and liquid coalesces into larger particles for removal in a mist extractor that may be located downstream. The end flange is removed for replacement of the elements. This type of filter offers the advantage of a high surface area per unit volume of vessel.

The amount of filter area needed is a function of the material, its density, the gas specific gravity and the method of construction. The following equation may be used to estimate the capacity of a given filter:

$$C = 38{,}400\ P^{0.47} \qquad (1)$$

where:

C = capacity in M.M.c.f. per day per sq. ft. of filter surface.

P = operating pressure, psia.

The capacity thus obtained may serve as a general guide for the sizing of filters if detailed information is not available for the specific element. If the element is located in the top of a separator, the capacity of the system may be limited by the vessel diameter as determined in Part 1 (*The Oil and Gas Journal, March 14, 1955, p. 107*).

CONTINUOUS AUTOMATIC SAMPLING—2

Don't Sell Sampling Short

Part 1 in this series presented background material on continuous sampling and discussed the principal problems encountered in collecting a relatively small sample of a commodity that will be representative of the entire shipment. In crude-oil trunk-line practice, the quantity of sample collected will seldom exceed one part per million and on large lines the quantity may be as low as one part in 10,000,000.

by F. H. Warren

IN 1951 the subcommittee on automatic devices, A.P.I. Code 25 had this to say about automatic samplers:

"Automatic samplers have not been universally accepted because of mechanical maintenance problems and the inability to obtain a true sample under all conditions, particularly when free water or high percentages of b.s. are encountered.

"It is obvious, however, that the taking of a ½-pint sample per hour manually and pouring it into a milk can with a not too tight fitting cover does not give a representative sample either, except under most favorable conditions.

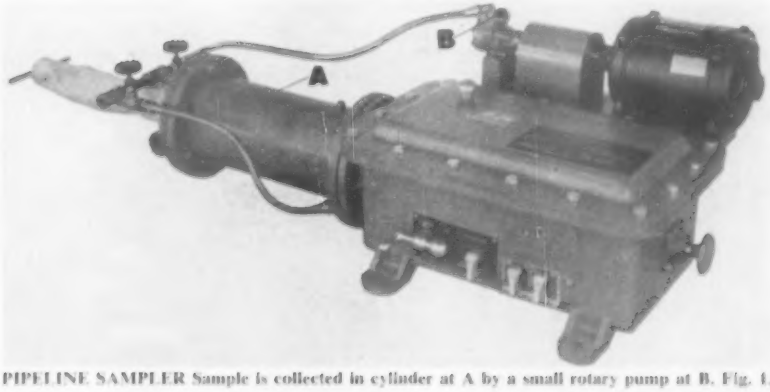
"We believe the problem will be solved by perfecting the automatic sampler. It is believed the preferred method of sampling will be by automatic means, but until samplers are perfected, we believe no change need be made in Code 25."

In the last 4 years, manufacturers have made improvements on models in production, have developed new samplers, and other models are under development.

In the preparation of a paper of this sort, the author runs the risk of failing to mention some manufacturer who may be well known in some areas, but with which he may not be familiar. If this has been done, it was unintentional.

The first six samplers to be described are designed for pipeline sampling. The last two are typical of measuring and sampling equipment designed for checking producing wells.

The author is with Ohio Oil Co., Findley, Ohio.



PIPELINE SAMPLER Sample is collected in cylinder at A by a small rotary pump at B. Fig. 1.

Nelson sampler . . . This sampler made by Nelson Electric Manufacturing Co., Tulsa, is the oldest of the modern pipeline samplers. The sample is collected in a cylinder shown as A in Fig. 1.

A small rotary pump shown at B takes oil from a sampling tube inserted in the pipeline, circulates it through a small line having a tee with side outlet connected to the outer end of the sample cylinder; then through a second tee with side outlet connected to the back end of the sample cylinder; then back into the pipeline.

A piston operates in the sample cylinder, and is mechanically driven by a piston rod, the outer end of which is threaded. The threaded end of the piston rod engages a split nut which is rotated by a solenoid and ratchet wheel. As the ratchet wheel revolves, the piston is moved inward, drawing oil from the side stream into the cylinder.

By having oil back of the piston at the same pressure as oil in the line, it is obvious that the sample will be retained under line pressure and no evaporation can take place. Before the sample is withdrawn from the cylinder, the agitator is worked one or two full strokes to agitate the sample.

The sampler is normally furnished with built-in timer that can be adjusted to collect 1 gal. in 6, 8, 12, or 24-hour periods, but is available for periods up to 96 hours. The sampler is also available for use with external timer or contact making flow meter.

Gilbarco sampler . . . This sampler, made by Gilbert & Barker Manufacturing Co., West Springfield, Mass., is an electronically controlled electromagnetic unit with a double coil-operated pump plunger. The unit is shown in Fig. 2. Control is by an electronic circuit which permits regulating the piston rate and thus the sampler delivery. The control may be supplied in two different models:

1. Proportional to time control with manual adjusting knob and dial calibrated in ounces per hour.

2. Proportional to flow control with automatic adjustment in accordance with flow rate by a pneumatic control unit.

The sampling unit consists of two coils enclosed in magnetic cases, which are alternately energized by the control

circuit and drive a reciprocating magnetic plunger. This plunger is coupled to and drives a hardened and ground steel piston in a steel cylinder which has been machined in the sampler body and lapped to a very close tolerance.

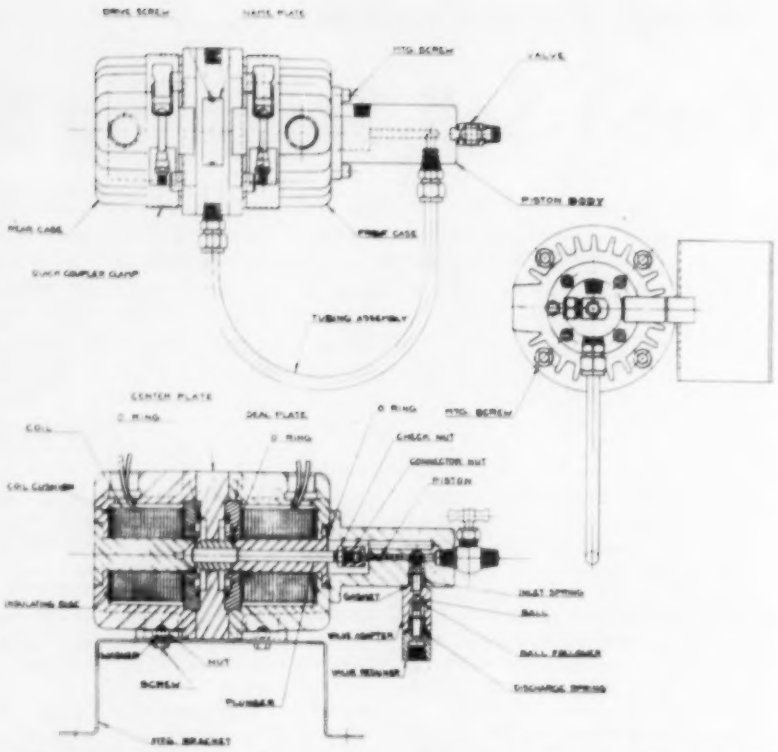
The body contains inlet and discharge valves of a special ball-type construction designed to reduce fouling of the valves. The balls in these valves are precision formed Kel-F and are spring-loaded to permit operation at line pressures of from 10 to 350 psi. A needle valve is provided to assist in bleeding air from the system and also to purge the system when changing products.

Provision is made to circulate the product from the pipeline through the sampling unit and back to the pipeline to reduce lag or holdup time and aid in obtaining a representative sample and also to prevent the dropping out of immiscible liquids in the product to be sampled.

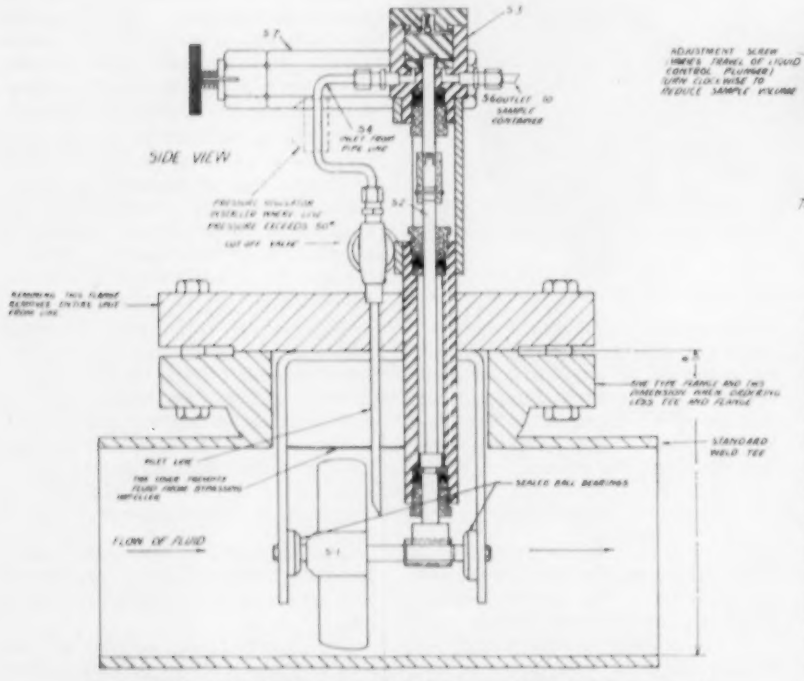
The control circuit is in an explosionproof box with a quick-opening inspection-hole cover which may be used for changing tubes and fuse.

A multivibrator generates pulses at a minimum rate of about 20 per minute when no external grid bias is applied to the tube. Applying positive grid bias speeds up the pulsing rate to a maximum of about 300 cycles per minute (at plus 113 volts d.c. bias).

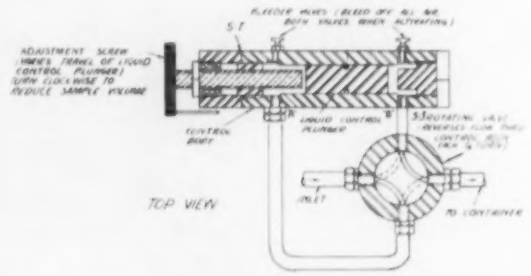
Control is obtained by varying this grid bias by means of a small potentiometer. Multivibrator plate and control voltage are stabilized by a voltage regulator to eliminate changes in pulsing rate as a result of line voltage variation.



GILBARCO SAMPLER is an electronically controlled electromagnetic unit with a double-coil-operated pump plunger. Fig. 2.



AUTOMATIC SAMPLER with a built-in flow responsive feature. Fig. 3.


ADJUSTMENT SCREW VARIES TRAVEL OF LIQUID CONTROL PLUNGER TURN CLOCKWISE TO REDUCE SAMPLE VOLUME
CONTROL SHAFT
LIQUID CONTROL PLUNGER
INLET
TO CONTAINER
TOP VIEW

McFarland sampler . . . This sampler, made by McFarland Engineering & Pump Co., Inc., Houston, is shown in Fig. 3. It is the one unit with a built-in flow responsive feature. It is installed in the line between flanges or may be had with ends beveled for welding. The mechanism is assembled on a flanged outlet opening of a tee and may be inspected by unbolting and removing the flange.

The sampler is driven by a propeller suspended in the main stream. A continuously rotating distributor valve shown at S-3, directs a stream of oil to alternate ends of a liquid control cylinder shown at S-7. At the

same instant another passage in the distributor aligns the outlet from the opposite end of the control cylinder with a tube leading to the sample container.

The size of sample taken may be adjusted by an adjusting screw to shorten or lengthen the stroke made by the control cylinder plunger.

Elliott sampler . . . The C & C liquid sampler, made by Kenneth Elliott Co., Alton, Ill., is a low-pressure sampler suitable for crude-oil applications where conditions do not warrant storing the sample under pressure. Fig. 4 shows the internal construction of the unit.

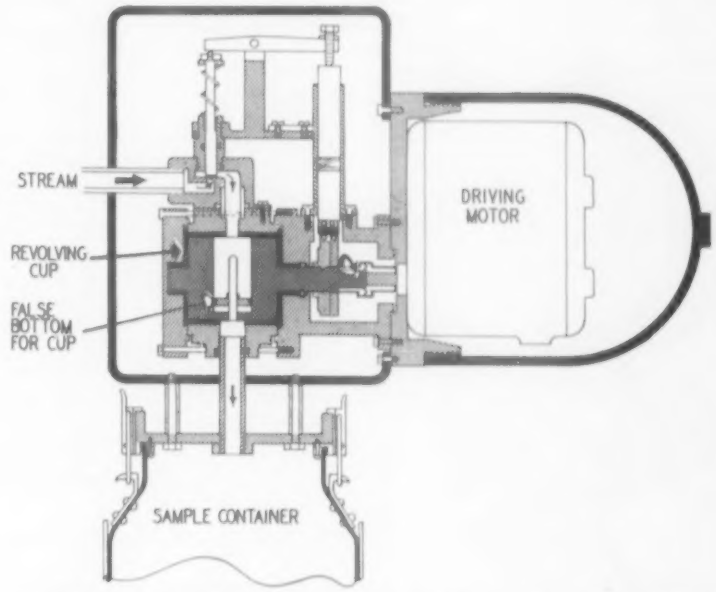
The sample-taking mechanism is similar to a plug valve having the port only part way through the plug. The driving motor makes one complete revolution at each sampling cycle, stopping with the cup of the revolving member in the draining position. Normally, the mechanism is timed to take samples at 5-minute intervals, but is availablle for use with contact making flow meters of positive-displacement meters.

The revolving member makes one complete revolution in 1 minute, then stands in the draining position until the beginning of the next sample taking cycle. As the cup portion of the revolving member moves past the entrance connection at the top, oil is admitted from the sampling line through what the inventors call a turbolater section, which imparts a swirling action to the oil and washes from the cup anything remaining from the previous sample.

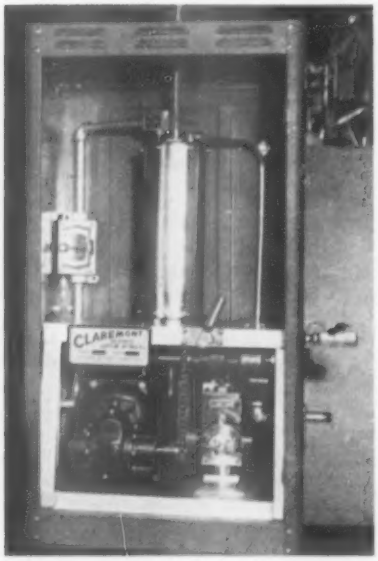
During the portion of the revolution that the sample cup places the inlet connection in communication with the overflow connection near the top of the sampler body, oil will be discharged to a sump or other suitable place of disposal. If placed near the pipeline being sampled, this flushing action will be sufficient to purge the sample line and sampler before taking a sample.

The size of each sample may be varied from 25 to 40 cc. by adjusting the position of a false bottom provided in the sample-taking cup.

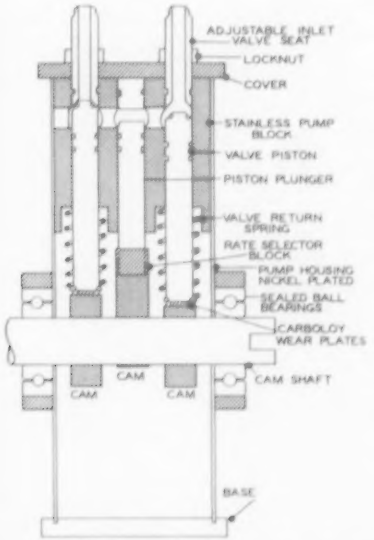
The driving motor and timing mechanism is enclosed in an explosionproof cast-aluminum case of the screw-on type for Class 1, Group D, applications.



LOW-PRESSURE SAMPLER suitable for crude-oil applications where sample is not stored under pressure. Fig. 4.



COMPOSITE SAMPLER takes surplus of crude from pipeline for sampling. Fig. 5.



CYCLOMETERING PUMP takes metered samples of oil and discharges into sample pressure bomb. Fig. 6.

Claremont sampler . . . The model S-149 composite sampler, made by Claremont Instrument Co., Inc., Chicago, is shown in Fig. 5. A rotary pump circulates a surplus of crude oil from the sample line to the cyclometering pump shown in Fig. 6, with the excess oil returning to the pipeline. The metering pump then takes metered samples of oil and discharges into a sample pressure bomb. When the sample bomb is filled, a limit switch shuts the unit down.

By setting the sampling rate selector dial shown, lower right in Fig. 5, the quantity of sample collected over a given period may be varied to suit conditions. The manufacturer offers a rate of flow compensator for sampling streams with a variable flow rate.

The Claremont Model S-131 is an ingenious sampler for collecting and storing samples in stoppered 1-pint bottles. A cyclo-metering pump performs the sampling operation, discharging a sample into one of several pint

bottles every 2 seconds until 400 ml. has been collected. The bottle is then automatically sealed and the turntable rotated to bring the next bottle into position for filling.

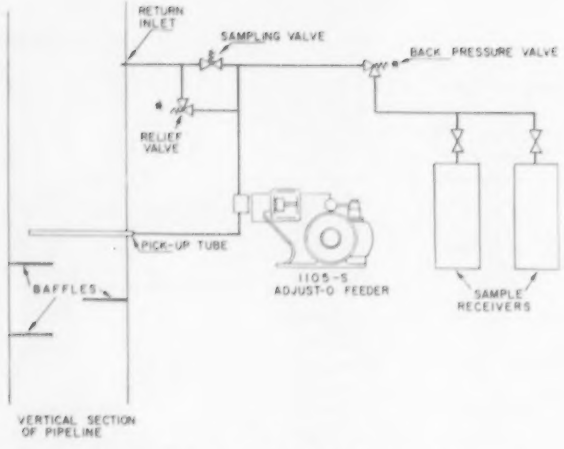
The cyclo-metering pump shown in Fig. 6 is equipped with piston valves with Teflon seats.

PROPELLER-TYPE METER controls sampling pump. Fig. 7.

Proportioneers sampler . . . An air or gas-driven sampling pump made by Proportioneers, Inc., Providence, has been used in several of the existing flow-responsive sampling installations. The sampling pump is controlled by a propeller-type meter shown in Fig. 7. After a predetermined quantity of oil flows past the meter, the pilot valve operating through a suitable four-way valve causes the pump to reciprocate, removing a sample from the pipeline, and delivering it through a back-pressure valve to the sample container.

The number of strokes made is a function of flow through the main line. The size of sample may be varied by adjusting the stroke of the pump. The manufacturer can furnish other types of meters, but the saddle-mounted propeller-type unit, equipped with anti-friction bearings, is reported to have good accuracy down to about 10 per cent of rated capacity and is the preferred type.

This manufacturer also offers a motor-driven sample pump. Normally, the pump is operated continuously to recirculate from the sample pickup

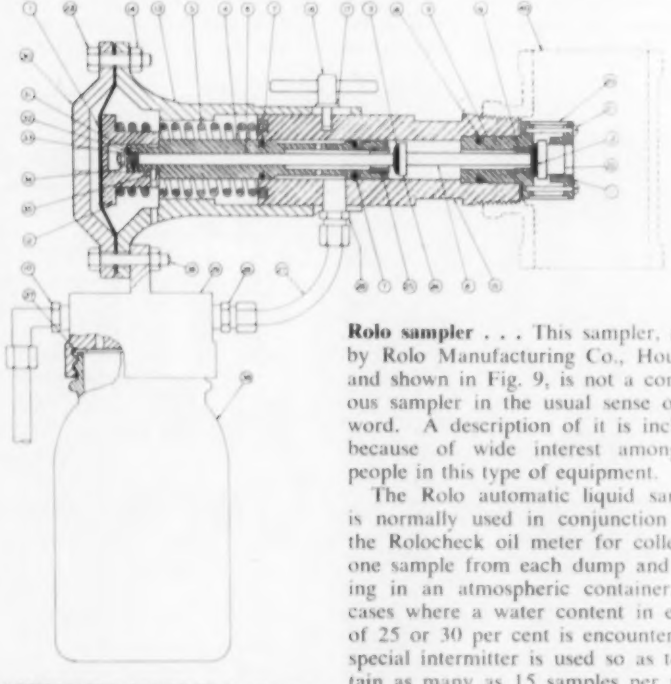


* BACK PRESSURE VALVE SET AT 25 TO 50 P.S.I. ABOVE LINE PRESSURE
RELIEF VALVE SET AT 75 TO 100 P.S.I. ABOVE LINE PRESSURE.

MOTOR-DRIVEN SAMPLE PUMP and associated piping. Fig. 8.

tube back into the pipeline as indicated in Fig. 8. At intervals of 1 minute, a solenoid "sampling valve" in the circulating line is closed causing the pump to deliver to the sample container through a back-pressure valve.

The size of sample increment delivered to the receiver depends on the length of time the sample valve remains closed. The control mechanism consists of a synchronous motor-driven cam with cam wiper positioned by the manometer of a flow meter. This meter extracts the square root of the manometer differential and initiates a flow-proportional time signal.



THIS AUTOMATIC SAMPLER is of a type which arouses wide interest among oil people. Fig. 9.

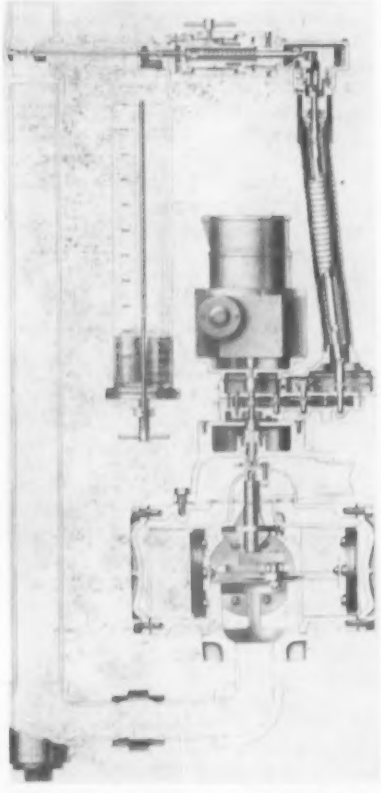
Rolo sampler . . . This sampler, made by Rolo Manufacturing Co., Houston, and shown in Fig. 9, is not a continuous sampler in the usual sense of the word. A description of it is included because of wide interest among oil people in this type of equipment.

The Rolo automatic liquid sampler is normally used in conjunction with the Rolocheck oil meter for collecting one sample from each dump and storing in an atmospheric container. In cases where a water content in excess of 25 or 30 per cent is encountered, a special intermitter is used so as to obtain as many as 15 samples per meter dump.

The sample-taking operation is ac-

complished by introducing air or gas pressure back of diaphragm 1, which causes plunger 4 to make contact with valve 3 closing the discharge line to the sample container. As plunger 4 continues to move inwardly, valve stem 8 moves valve 2 away from its seat in displacement piston 9 and moves piston 9 into the flow line.

When pressure back of the diaphragm is released, spring 5 moves plunger 4 outwardly, first permitting valve 2 to close and secondly opening valve 3. Pressure within the flow line forces displacement piston 9 to discharge sample into the sample container. By changing the over-all length of the sampler body, the size of sample may be varied to suit the particular conditions.



FLOW RESPONSIVE SAMPLER designed primarily for checking producing wells. Fig. 10.

Pittsburgh sampler . . . This oil-field meter and sampler, made by Rockwell Manufacturing Co., Pittsburgh, shown in Fig. 10, is a flow-responsive unit designed primarily for checking producing wells. The unit consists of a 1½-in. piston-type meter which furnishes power to operate the sampler.

The rate control may be set to take 2, 4, 6, or 8 samples per barrel. The size of sample extracted may be varied by adjusting the degree of valve opening. The sample is withdrawn by a snap-action valve installed in a vertical discharge line from the meter.

The Sample Container

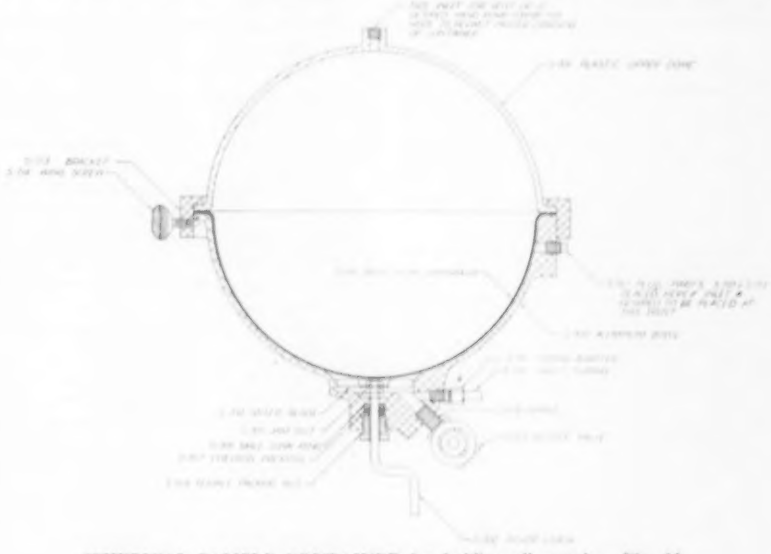
Manufacturers have devised several novel sample containers (Figs. 11, 12, and 13). One manufacturer makes use of a plastic bag protected by a metal case. Another uses a synthetic-rubber diaphragm which rides on top of the oil. For the more severe conditions, sample containers are available having pistons operating in cylinders arranged in such a manner as to maintain the sample under line pressure.

The old 2 or 3-gal. milk can is still in wide use as a sample container and, with some modification, will probably be the best choice for a large percentage of the applications for a long time. There are many instances, however, where the covered bucket permits too much evaporation and it becomes necessary to use one of the more expensive and cumbersome pressure containers. The following factors should be considered in selecting the proper size and type of sample container:

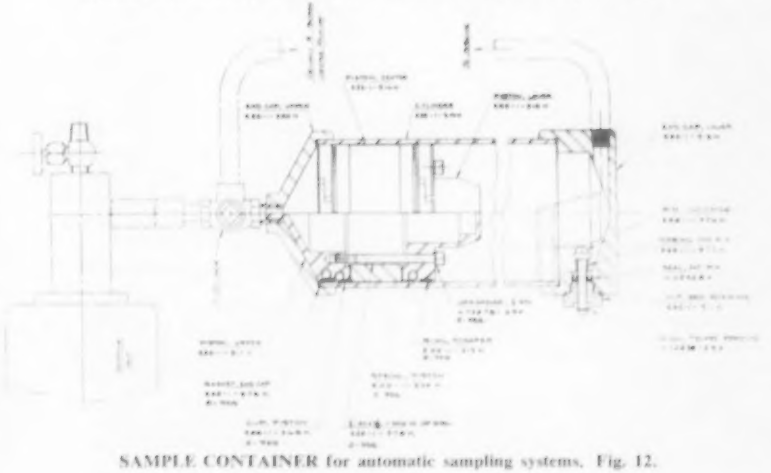
1. The vapor pressure of the liquid.
2. Over how long a period is the sample collected.
3. Of what monetary importance is it to maintain the original gravity of the sample until tested.
4. What other sacrifices must be made in order to preserve the original gravity of the sample, such as: (a) difficulty or impossibility of transporting the sample container to the laboratory; (b) difficulty of obtaining a representative sample from the container; (c) difficulty of cleaning the container; and (d) excessive first cost and upkeep.

We cannot overemphasize the importance of securing a representative sample of the original sample for b.s. and w. tests, and of not taking a larger sample than necessary.

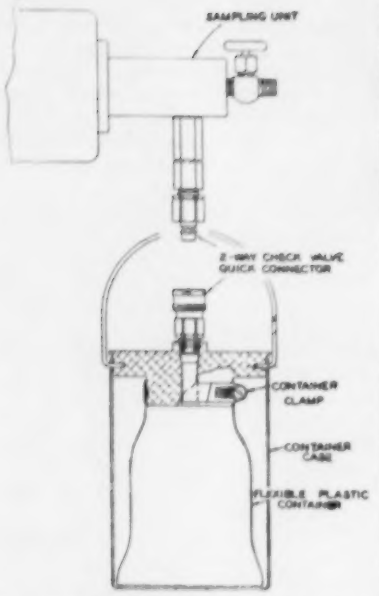
One member of the A.P.I. Committee on Automatic Samplers reported a case involving a high percentage of free



SPHERICAL SAMPLE CONTAINER for holding oil samples. Fig. 11.



SAMPLE CONTAINER for automatic sampling systems. Fig. 12.



PLASTIC SAMPLE BOTTLE *for automatic sampling units.* **Fig. 13.**

water. It was impossible to obtain a representative sample from the sample container except by using a small rotary pump to circulate the sample. When the free water became thoroughly commingled with the oil, oil was drained directly from the circulating line into the centrifuge tube.

In our company, we have been trying various methods of transferring a representative sample from the sample container to the test tube. It is easy to obtain quite uniform results by centrifuge test when there is no free water in the sample and the b.s. content is not over about 0.2 per cent.

However, the problem becomes more difficult as the b.s. and w. content goes up. One manufacturer suggested the use of a small air-motor-driven mixer for agitating the contents of the sample container prior to removing a sample for testing. Preliminary tests indicate that much more uniform test results are possible if the contents of the sample can are agitated with the air-driven mixer a minute or two prior to, and while the centrifuge tube is being filled.

Centrifuge tests of samples transferred from the can in this manner have varied as much as 0.2 per cent from those taken after stirring with a paddle.

Acknowledgment

We owe the manufacturers thanks for investing their time and resources in an attempt to meet our needs. They cooperated fully in supplying material for this article.

Many hlpful suggestions were received from members of the Automatic Sampler Committee of the A.P.I. Committee on Crude Oil Measurements.

THE PROBLEM—

More Compressor Horsepower, Reduced Noise Level

Here's how the "impossible" was done

by Raymond C. Baird

RAPID growth of population in the Los Angeles area made it necessary for Southern California Gas Co. to enlarge its Playa Del Rey compressor station. Compressor horsepower had to be added and noise level had to be reduced at the same time. The combined requirement would have been impossible to achieve without vigorous exercise of noise control.

The latest techniques in noise control were used. They were expensive but successful. Noise levels throughout the station and in nearby residential areas were either reduced considerably from their former level or changed in character so as to be less noticeable.

The problem was considered to comprise five distinct parts: (1) engine-exhaust noise, (2) engine-intake noise, (3) engine-room noise, (4) heat-exchanger noise (cooling tower and fin-fan), and (5) blowdown noise.

These components were deemed to fall into two general categories, noise affecting the plant operator and noise radiated into surrounding residential areas. In the following discussion it should be borne in mind that a Playa del Rey compressor facility was already in existence as shown in Fig. 1.

Basis for design . . . It was naturally desired that as much of the existing equipment as possible be used in the new plant. The Cooper-Bessemer GMV-6's and GMA-10's were retained intact on their original foundations along with the atmospheric-type cooling tower and a number of pressure vessels and storage tanks. With these as a nucleus the new plant was designed for two new GMVA-10 units initially, with space for future additions.

The New Plant

Fig. 2 shows schematically the engineered modification and expansion. Increasing the horsepower capacity required that the cooling tower (C) be extended and a fin-fan (F) be included. The compressor building is of brick construction for effectively containing engine-room noise. Compressor units (1) and (2) are the GMV-6's (660 hp.) and the GMV-10's (1,100 hp.), respectively. Compressor units (3) are the new GMVA-10's (1,350 hp.).

Intake filters are located in two brick-walled rooms (I), one at each end of the building, with intake piping in a trench running through the building (Fig. 3). Nearly all the yard piping is located in pipe trenches (P). Residential protection from pipe noise radiated towards the west is gained from a wall (W) which also serves to enhance plant appearance by destroying compressor plant "look."

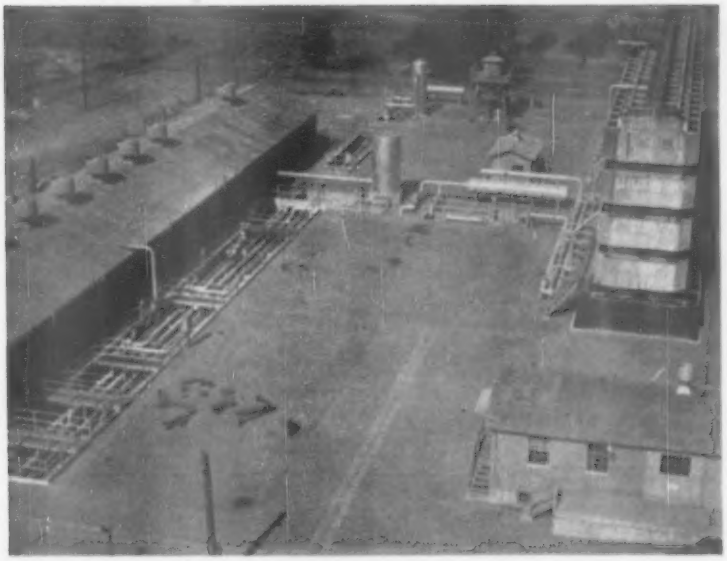
Radiation of pipe noise to the south will be inhibited by the office building (O) now in process of construction. The ultimate inclusion of a considerable amount of vegetation will further limit radiation of high-frequency pipe and miscellaneous plant noise. The cooling tower effectively prevents radiation of noise towards the east while that propagating north is of little consequence because of geography and lack of residential habitation either now or in the foreseeable future.

Compressor Building

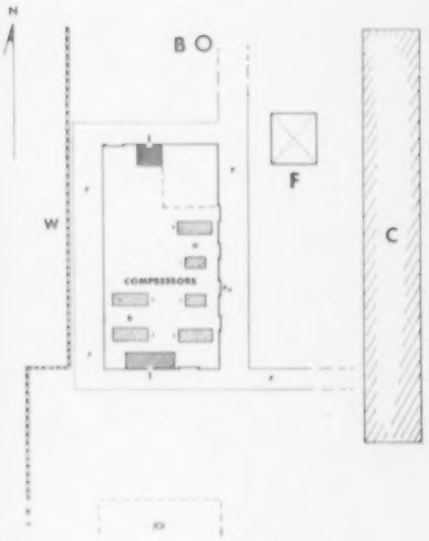
The design of the compressor building included most of the noise-control measures. Fig. 3 illustrates the basic plan. The use of barrier-type construction was well in keeping with the need for residential eye appeal and ideally suited for the containment of engine-room noise. However, unless means are incorporated within such a housing for dissipating mechanical noise, sound levels can become exceedingly high through the phenomenon of reverberation. Accoustical ceilings (A) were therefore incorporated.

Noise coming directly from the compressor units was effectively reduced by putting lagging on expansion bot-

The author is consulting engineer at Santa Monica, Calif. Paper presented at Pacific Coast Gas Association special services conference, Santa Monica, Calif.



BEFORE MODIFICATION started, Playa del Rey compressor station looked like this. Fig. 1.



AFTER MODIFICATION, with new part of compressor building to left. Fig. 2.

tles, exhaust lines, and portions of the intake lines. Additional benefit was derived from the large access doors A_1, (see also Fig. 2) which were formed with perforated interior surfaces backed with sound-absorbing material.

A positive-displacement method is used to insure good room ventilation. Simultaneously this eliminates noise seepage through large ventilating ports which would otherwise be required. Ventilation is obtained by blowers (B) discharging downward into the room.

Intake lines (I) are placed in a trench leading to the intake rooms. The latter are of masonry construction to prevent intake noise from entering the engine room. The intake room design included de-resonating features. Combining the intakes in this manner reduces radiated noise because of the acoustical capacity of the rooms themselves.

The roof is double-ridged and the residential-type mufflers, (M) are placed in the trough. This allows relatively short exhaust lines. Acoustical reflection due to roof geometry causes higher-frequency exhaust-noise components getting through the mufflers to propagate more or less vertically upwards. This feature has relatively little effect on the fundamental exhaust-noise frequencies, however. Reliance is placed on premium-type mufflers for low-frequency attenuation.

Plant Appearance

The physical appearance of the yet-unfinished plant is shown in Figs. 4 and 5. The intake and exhaust systems are ideally placed to minimize noise radiation to the west, the direction of the nearest residential section.

Fig. 4 shows the muffler installation. Note the high degree of defilade afforded by the double roof. Orientation of the tail-pipe bevels help direct residual high-frequency exhaust noise to the north toward uninhabited swampy flats. Several of the ventilating blower intakes can be seen.

The engine room appears in Fig. 5 with its split sound-absorbing ceiling. This picture was taken from the projected location of future compressor units. The spacious effect gained by the unusual placement of exhaust and intake lines is readily apparent. To provide natural light without compromising the acoustical barrier characteristics of the building, windows of glass brick were used. Room lighting is enhanced by the light reflecting properties of the white-colored acoustical ceilings and the luster of the aluminum-covered access doors.

Blowdown Silencer

This important piece of noise control equipment is designed to handle blowdown gas at a rate of 5 M.M.s.c.f. per hour, a large portion of which ex-

IT'S A FAST MOVING TREND . . .

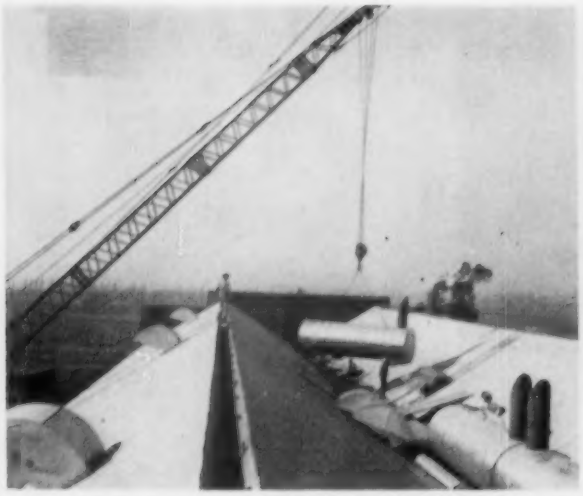
The trend towards better noise control in plants and facilities is rapidly accelerating. The human ear and nervous system are simply not able to cope with increasingly noisy environments.

Operation of a typical compressor plant provides a complex noise source indeed. Sound levels produced may be so intense that protracted exposure can seriously impair hearing ability.

Because of both the annoyance and the occupational safety factors, Southern California Gas Co. decided to incorporate noise-control measures in its plans for the modification and expansion of its Playa del Rey compressor station.

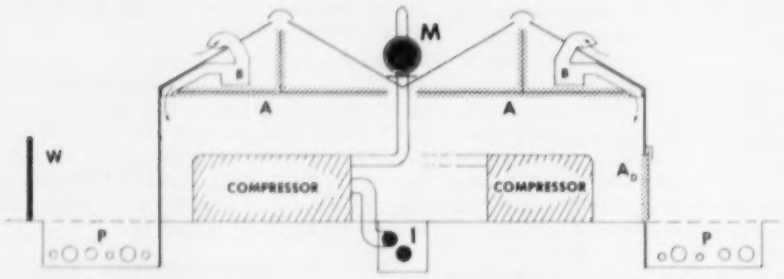
A description of the typical compressor station as a noise source was presented in an earlier paper by the writer.[1] In that paper the basic techniques applicable to noise control were described. The work covered requirements of the then-projected Playa del Rey expansion.

This paper describes the results of the noise-control features subsequently incorporated. The plant will ultimately contain greater horsepower than is now installed it is believed that the present satisfactory noise situation will be retained.



NEW COMPRESSOR BUILDING has piping in trenches, acoustically insulated ceilings, positive-pressure ventilation. Fig. 3.

ENGINE ROOM with its acoustical ceiling. Vacant space in foreground is for future compressors. Fig. 5.



EXHAUSTS AND MUFFLERS are installed in roof trough, masking residences to the west from direct noise. Fig. 4.

pands from a pressure of about 1,500 psig. to atmosphere. The stack is 6½ ft. in diameter and stands 24 ft. high.

The silencing technique involved is based upon a successful silencer design developed for cat cracker blowoffs.

In addition to its station blowdown function this unit also takes care of all routine blowdown requirements. For this, all individual compressor blowdowns are combined in a piping system terminating at the silencer.

Results

Engine-room noise . . . As indicated it was desired to reduce both engine room and radiated plant noise as compared with that of the original plant in spite of greatly increased installed horsepower. The degree to which this has been accomplished for the engine room is clearly shown in Fig. 6.

This graph presents the before and after noise levels at a point midway between two of the original compressor units (location a of Fig. 2). The data are in the form of octave analyses wherein integrated noise energy for different segments of the audible spectrum are measured separately. These segments numbered 1 to 8 refer to specific frequency bands as follows:

Band	Frequency range (c.p.s.)
1	20-75
2	75-150
3	150-300
4	300-600
5	600-1,200
6	1,200-2,400
7	2,400-4,800
8	4,800-10,000

Fig. 6 shows that a real improvement in engine-room noise has been effected, particularly for the higher-frequency bands where the ear is most sensitive. Total sound level has decreased from about 99 to 95 db., as directly measured by a sound-level meter. This reduction occurred despite the fact that the two new GMVA-10 units were operating when the "after" data were being taken.

It cannot be said, of course, that the improvement has resulted because of the acoustical ceiling alone in view of the other measures simultaneously incorporated such as pipe and pressure vessel lagging, and increased room volume. The fact remains, however, that the operator is now bathed in much less noise than he was, with the noise being of a less-annoying or disturbing quality.

Noise intensity at locations away from points a and b (Fig. 2), where the operator is less subjected to directly radiated engine noise, is generally less by as much as 3 to 4 db. Such a beneficial reduction rarely exists in the typical untreated engine room because of reverberation. Intensities of 102 to 110 db. are not unusual for the latter and exist generally throughout the room.

The noise situation near the new engines is shown in Fig. 7 as curve "B" (location b of Fig. 2). By comparison, curve "A" is based on measured data for a number of typical engine rooms housing GMVA-10's The larger improvement afforded by noise control at Playa del Rey is obvious.

Curve "D" is a replot of the "after" graph of Fig. 6. for purposes of comparison. The hump in "B" for band 4 apparently results from engine intake blower operation and, interestingly enough, is reflected in curve "D."

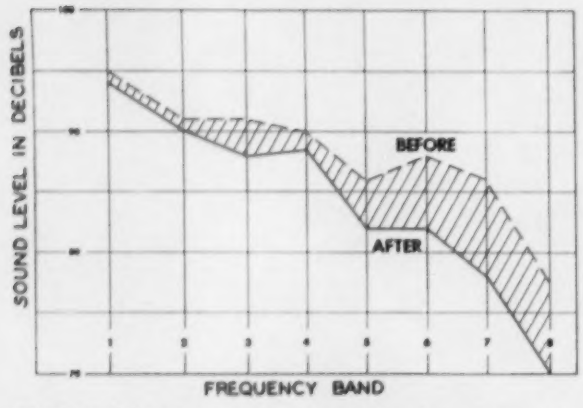
This characteristic was not noticed when the field data for curve "A" were obtained due to the relatively high noise levels present due to reverberant buildup. At Playa del Rey this charateristic is unmasked and therefore easily apparent to the ear.

Curve "C" appeared in the paper referred to.[1] It is a predicted noise analysis for GMVA-10 units in a barrier-type engine room containing a nominal amount of sound-absorbing material for reducing reverberation. This curve was based somewhat on curve "A," corrected for feedback of exhaust and intake noise into the engine room.

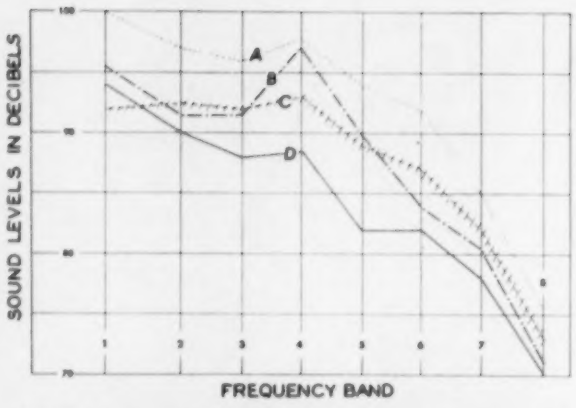
It appears that the problem of engine-room noise with regard to harmful psychological and physiological effects has been adequately handled at the Playa del Rey plant. The installation of additional compressor units

Visco

CONSISTENTLY EFFICIENT OIL FIELD CHEMICALS



SOUND LEVELS taken before and after station changes were made. Fig. 6.



CURVE B is the measured sound level near the new engines. Curve A is the level near similar engines in other stations. Curve C is the calculated level and Curve D is the over-all station noise level. Fig. 7.

should have little effect on the engine-room noise picture.

Radiated plant noise . . . Noise radiated from the plant is of a character which renders it virtually unnoticeable. This is because it contains no obvious frequency components, a situation far different from that associated with the original plant. Then, several distinctive engine noises were easily discernible at a considerable distance, especially at night under favorable meteorological conditions. It is now possible to hear the sound of the cooling tower at a distance, originally impossible because of engine noise masking.

Sound levels 50 yd. away from the baffle wall (location of Fig. 2), have an audibility value of 70 db. or less. With regard to sheer sound level this is little different from the situation with the original plant. However, it seems far better to the ear because of the absence of easily audible components. Considering that the plant now operates with about twice the amount of horsepower, it would appear that the radiation-noise problem has also responded well to the noise-control measures instituted.

Noise-Control Cost

The writer knows of no serious efforts made towards evaluating what might be called a reasonable cost per decibel of noise reduction. There are entirely too many intangible variables involved. Nevertheless, it might be of interest to know the amount of "extra" dollars spent to insure that the Playa del Rey facility be socially acceptable. The additional expense is approximately as shown in the tabulation.

There might be some question about including all of items 6 and 7 as purely noise-control expenditures in view of the original need for appearance in keeping with a residential neighborhood plus the probable benefit from long term maintenance cost. The indicated total, however, amounts to about 3 per cent of the plant investment.

ADDITIONAL EXPENSE

Item—	Cost
1. Acoustical ceiling	$16,500
2. Lagging	6,000
3. Blowdown silencer (installed)	6,000
4. Blowdown piping system	7,000
5. Special intake arrangement	4,000
6. Baffle wall	7,000
7. Extra for brick building compared to transite construction and corrected for muffler installation, vented attic, catwalks, etc	11,500
Total	$57,500

In analyzing the value of noise control cost for Playa del Rey it must be remembered that authority for the expansion was granted contingent on a guarantee that the noise problem would be kept completely under control. This meant that the noise situation originally existing had to be considerably improved. On this basis the cost of noise control loses it ssignificance. Expense was nevertheless watched during the design stages to guard against unnecessary cost.

The better working conditions afforded the operators will doubtless contribute to less operating and maintenance expense over a period of time. For example, operators will be in a better position to tell when compressor units are in need of preventive maintenance because they can detect by ear changes in characteristic mechanical sounds which indicate developing trouble. Remedial action can then be taken before expensive damage occurs.

Operator judgment will not be affected by mental dullness induced by constant noise as might happen in typical engine rooms where sound levels of 105 to 110 db. are routinely encountered. The elimination of excruciating blowdown noise is of much importance to the well-being of operators to say nothing of nearby residents.

From the long-term viewpoint the reduction in probable compensation cost for noise-induced deafness of employes must also be weighed in the balance. The coverage of workman's compensation laws are moving steadily in this direction as the public becomes more and more aware of the harmful effects of noise.

Conclusion

Noise-control measures used at Playa del Rey have resulted in considerable benefit both from the standpoint of operating personnel and the maintenance of a satisfactory noise condition in nearby residential areas. These masures probably represent the maximum practicable amount for a plant of this type.

Truly low-cost noise improvement for compressor plants will have to come via treatment of the primary noise sources themselves, the compressor engines. Exhaust and intake noise energy can be reduced by careful design of manifolds and flow passages when considered together with exhaust and intake lines and their manner of acoustical termination. The reduction of mechanical noise would appear to be more difficult but of lesser importance.

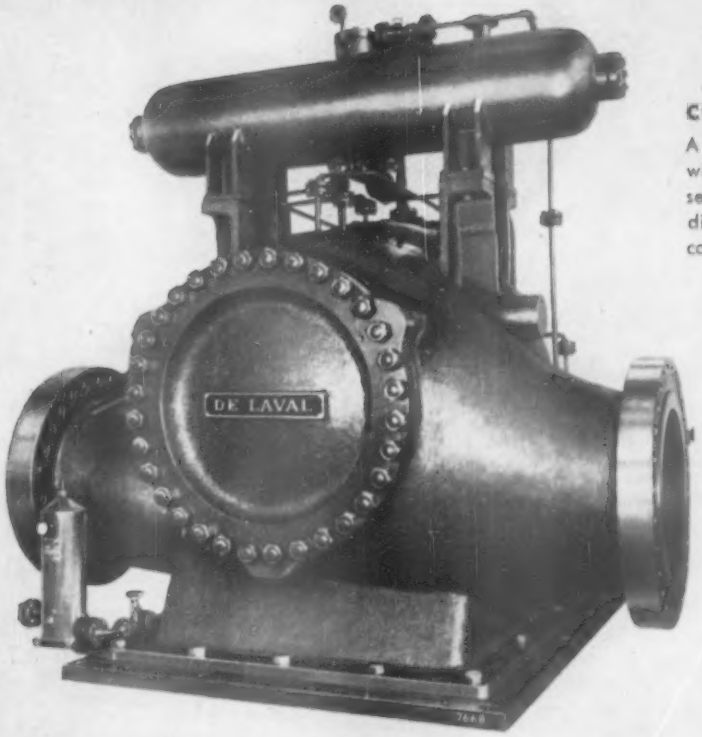
Noise control of a compressor station is a complex problem which requires close attention to detail. The techniques employed will vary widely with the economic requirements of the basic plant design.

Reference

1. "Compressor Plant Acoustics," 1955, P.G.G.A. Proceedings, also published in Pipeline News, Vol. 27, No. 7, July 1955, page 32, and in Pipeline Industry under the title "Noise-Controlled Compressor Station Within a Residential Area," Vol. 3, No. 1, July 1955, page 20.

DE LAVAL
CENTRIFUGAL PIPELINE COMPRESSORS

come in two "packages" for easy installation

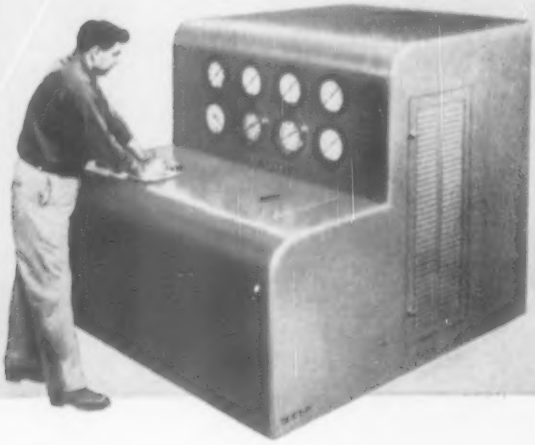


COMPRESSOR

A De Laval compressor with its emergency seal tank mounted directly on the compressor.

CONSOLE

The console contains the filters, motor-driven pumps, coolers, pressure switches, gauges and other accessories. It eliminates complicated piping on the packaged compressor . . . also serves as a protective cover for the equipment it houses.



Bulletin 503 gives data on De Laval centrifugal pipeline compressors. Write for your copy.

Designed in two packages, rugged De Laval centrifugal compressors offer many important engineering features. Among these are • high pressure contact shaft seal which eliminates gas leakage • heavy and rigid construction throughout • high load carrying capacity. The compressor and console arrangement makes De Laval centrifugal compressors easy to install—only simple low-cost foundations are required. De Laval units, totaling more than 280,000 horsepower, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
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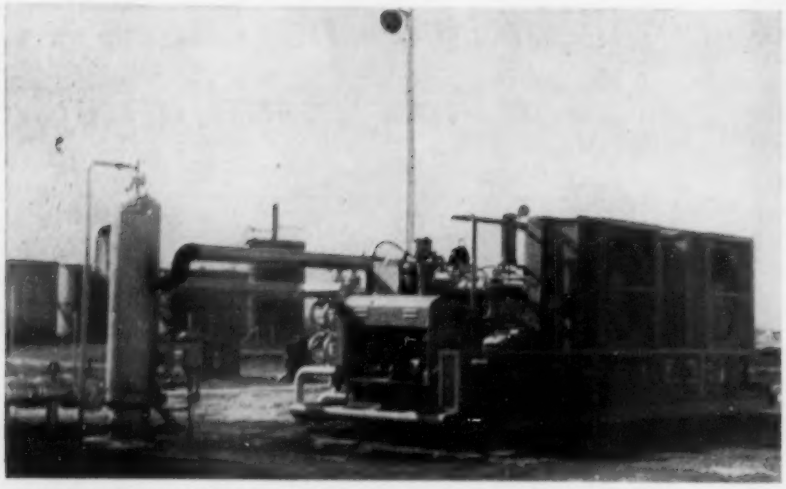
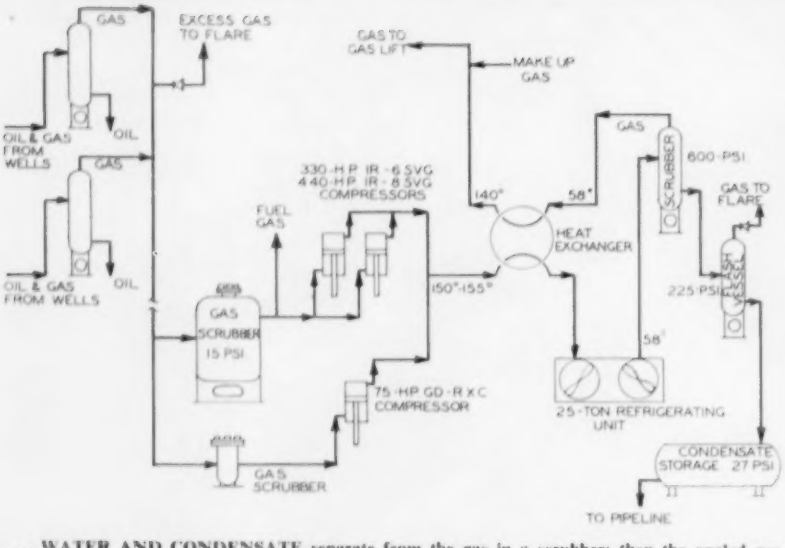


REFRIGERATION UNIT takes heat from the gas stream and dispels it to the atmosphere by cooling fans . . .

Refrigeration Stops Trouble



. . . WATER AND CONDENSATE separate from the gas in a scrubber; then the cooled gas helps cool the warm gas coming into the unit.

On Gas-Lift System

Southern Minerals Corp. has put a refrigeration system on the gas it uses to gaslift wells in Falls City field of Karnes County, Texas. The mechanical system has not only stopped troubles caused by formation of hydrates in gas lines and intermitters, it has also upped the recovery of hydrocarbons enough to make the unit pay out in a very short time.

by Ed McGhee
District Editor

ALTHOUGH South Texas winters are mild, there is enough cold to make trouble if gas contains too much water. Hydrates form, stopping lines and causing malfunction of control equipment. In operating a gas-lift system in Falls City field of Karnes County, Texas, Southern Minerals Corp. uses a gas that formed hydrates at temperatures below 55° F. As a result, lines became plugged and intermitters quit operating during cold spells. The problem season is too short to make ordinary dehydration methods attractive the year around.

The solution Somico settled on was a mechanical refrigeration system that not only removes the water, but also recovers more condensate from the gas. Since the equipment was put into operation, water trouble has stopped entirely and distillate recovery alone will pay for the investment in a very short time.

Compressors already set . . . Two angle and one belt-driven compressors totaling 845 b.hp. were installed originally at Falls City. Together, these handled about 3,900 M.c.f. per day, compressing gas from the 15-psig. gathering system to 600-psig. gas lift. Later on, to boost the output to take care of additional wells coming onto gas lift, two more belt-driven compressors of 130 b.hp. each were added. This brought the total compressor capacity to about 5,100 M.c.f. per day. Forty-eight wells are gas lifted, almost all of them on intermittent flow.

Then, the following equipment was added to take care of refrigeration dehydration and condensate recovery: an automatic, gas-engine-driven, air-cooled, 25-ton mechanical refrigeration unit; two six-section heat exchangers, concentric finned-tube type; two horizontal condensate storage tanks, 27 psig. w.p., (these were formerly 50-psig. w.p. vertical absorbers); and necessary pressure piping and fittings. By increasing the size of the prime mover and adding heat-exchanger sections the refrigeration unit's capacity can be enlarged to 40 tons when needed at a later date. The installed cost per ton of refrigeration was approximately $725.

Operation is trouble free . . . Thus far, the mechanical refrigeration system has been reliable and trouble free. Temperature of gas coming out of the compressors is usually between 150° and 155° F. After the compressed gas passes through the heat exchanger and the refrigeration unit, the temperature is down to about 58° F., and it passes into a stripper for removal of liquids.

From the stripper, the cold gas passes back to the heat exchanger. The counterflow exchanger is so efficient that

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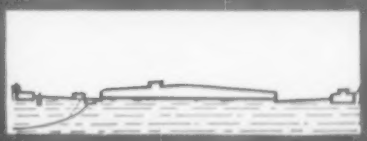

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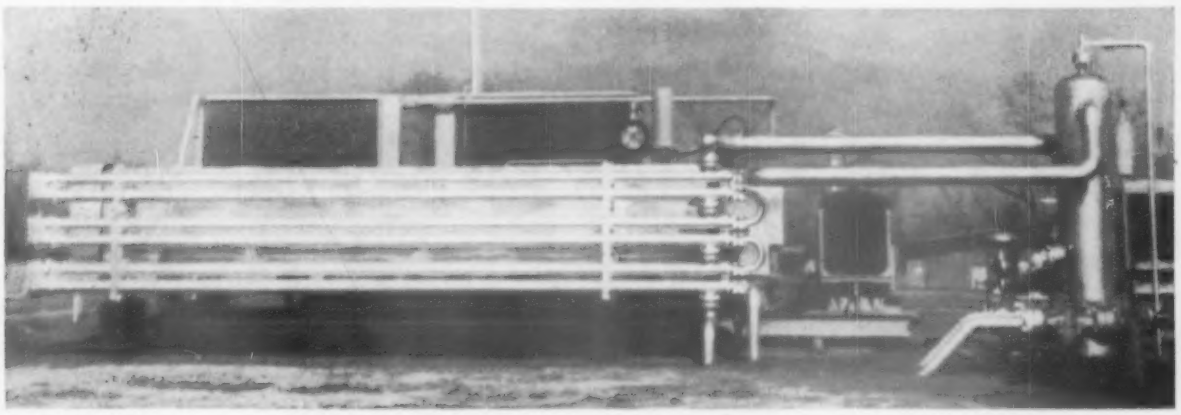


HEAT EXCHANGER helps refrigeration unit by using cool gas to remove heat from the incoming stream. Operation of the unit is automatic and lowers the gas temperature to 58° F.

the gas is brought back up to about 140° F.—within 15° of the temperature of the gas coming out of the compressors.

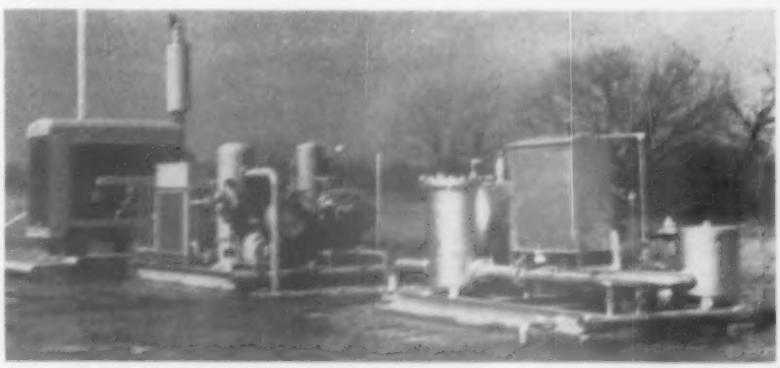
The refrigeration unit itself has two fans that dispel heat from the refrigerant; and these operate according to the temperature of the gas going into the stripper. If only one fan is enough to keep the gas down to around 58° F., only one will operate; if both fans are necessary, both operate. Somico operators have noted that when atmospheric temperature is 35° F. or lower, neither fan operates.

80° days, 40° nights . . . The Falls City area very often has a big difference between daytime and nighttime temperatures. It is not unusual for temperature to reach 80° F. during the day and then fall to 40° during the night. As a result, there was some trouble at first in keeping the refrigerant compressor properly loaded. When air temperature was especially low, the suction pressure on the Freon 12 refrigerant would fall and overload the compressor.

Therefore, Somico has installed controls on the engine driving the refrigerant compressor to vary its speed according to the temperature of the Freon 12 suction. If the refrigerant temperature falls to 40° F., the controls begin to slow down the engine. If the temperature drops on down to 32° F., the controls cut the engine back to idling speed.

Recovery is up . . . Recovery of condensate during the winter months before the equipment was installed was about 33 bbl. per day. Since the equipment has been operating, recovery has gone up to about 68 bbl. per day—some 35 bbl. per day higher than before. Somico engineers expect that this added recovery will be as high as 55 bbl. per day during the summer months for an average increase throughout the year of 46 bbl. per day.

COMPRESSOR PLANT of Southern Minerals Corp. compresses about 4,650 M.c.f. of gas per day for gas lifting 48 wells.



ADDITIONAL COMPRESSOR was added to the system to take care of new wells coming onto gas lift. Compressors have speed controls to compensate for intermittent gas-lift demand.

The composition of the liquid in the stock tanks at 27-psig. w.p. is approximately 1 per cent propane, 15 per cent butanes, 44 per cent pentanes, and 40 per cent hexanes plus.

At any rate, the equipment including the pressure storage will be paid for in a very short time by the added condensate recovery.

Automatic controls . . . Pressure, temperature, and speed controls together with preventive and periodic maintenance schedules have eliminated the usual three shifts of operating labor for this miniature gasoline-recovery plant. Speed controls are essential because almost all of the Falls City wells are intermittently gas lifted.

Makeup gas . . . Some makeup gas must be purchased from sources other than Falls City since none is available here to compensate for fuel gas used by the compressor prime movers, pipeline-pump engines, heater treaters, and the Somico camp. Fortunately the makeup gas is from a high-pressure gas well that Somico owns in another field.

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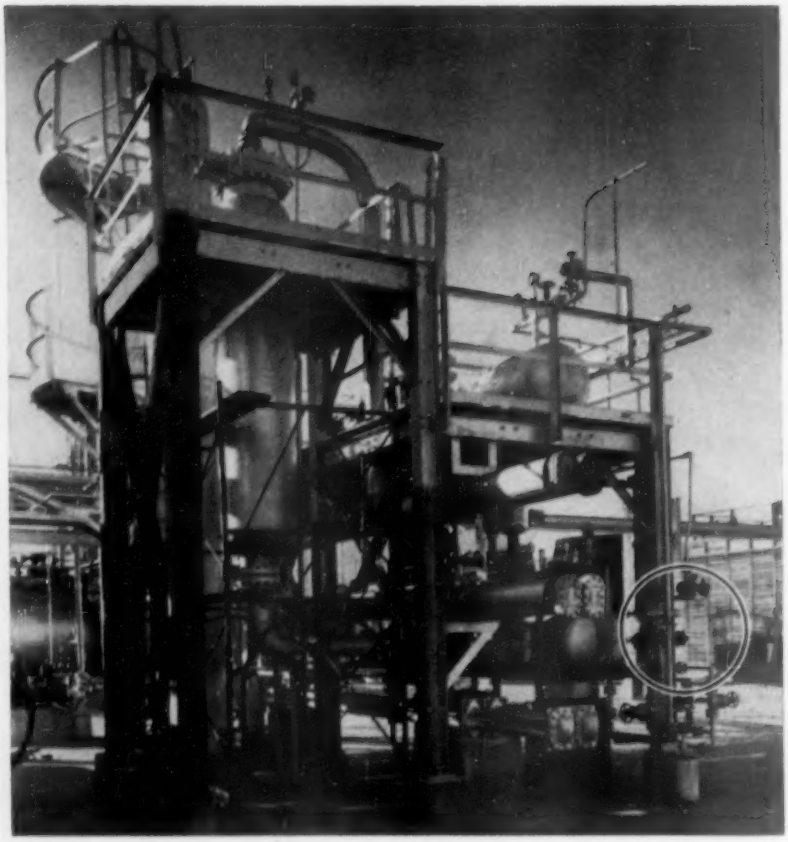
2. Improved reliability
3. High sensitivity and quick response
4. Universal instrument—performs other duties
5. Easy installation



UNIFINING UNIT has, left to right, surge drum, reactor, exchangers, and high and low-pressure separators. Some of electronic control system components are visible at extreme right in circle. Photo courtesy Rock Island Refining Corp.

by D. P. Thornton, Jr.

THE first electronically controlled Unifining unit has been operating successfully for more than 2 months at Rock Island Refining Corp.'s refinery near Indianapolis. It produces a specially treated feed stock for the company's U.O.P. Platforming unit, which likewise has the distinction of being the first complete refinery unit in the United States to be electronically controlled.

This Unifining unit has:

- Eliminated a catalyst-poisoning problem for the U.O.P. Platforming unit.
- Improved the quality of visbroken gasoline.
- Raised the octane rating of the refinery's gasoline pool by one number.

The Unifining unit at Rock Island is unusual in several respects. Because of its particular feed material the unit operates at a pressure considerably lower than normally used for the processing of stocks containing cracked components.

This, in turn, is responsible for permitting the unit to be designed to use Platformer excess hydrogen direct from that unit without recompression. Eliminating the compressor and processing at a lower pressure resulted in a considerable savings in construction costs.

Thanks largely to electronic instrumentation the initial startup of the Unifining unit was virtually trouble free.

Problem . . . The problem which Rock Island faced was that the plant has 150 bbl. per day or so of visbreaker gasoline available which could not be blended directly into pool gasoline for quality reasons. It was desirable to reform this material to boost octane rating. However, to mix it into Platformer charge would prove to be a costly matter because the platinum-containing catalyst would be poisoned by contaminants.

Unifining selected . . . Unifining, a catalytic hydrogenation process developed by Universal Oil Products Co. and Union Oil Co. of California, was chosen to solve this problem.

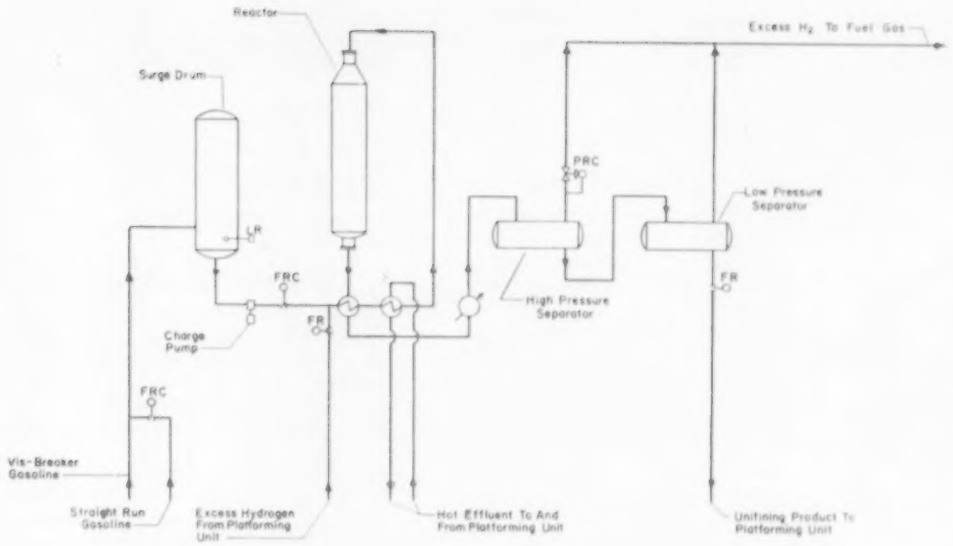
Briefly, the Unifining process involves charging the liquid feed and hydrogen as a mixture to the fixed-bed reactor at 500 to 750° F. The products then are cooled, flashed, and stabilized. Unreacted hydrogen may or may not be recycled.

During Unifining, unsaturates are hydrogenated; sulfur, nitrogen, and oxygen compounds are converted to hydrocarbons and hydrogen sulfide, ammonia, and water, respectively. In addition, metallic impurities are removed from the hydrocarbon fractions. The rugged catalyst operates for extended periods without significant activity loss and for all practical purposes is not poisoned by metallic components in the charge stock.

Economic evaluation . . . The first problem with the Rock Island unit was economic justification in view of the small size indicated—300-bbl. per day design. In the usual design of such units, the Platformer vent hydrogen is boosted in pressure before entering the Unifining unit. However, pilot-plant investigation proved that the process was commercially feasible at lower pressures under the particular circum-

Author is chemical engineer, public relations department, Universal Oil Products Co., Des Plaines, Ill.

REFINING



VISBREAKER GASOLINE is the principal stream fed through the Unifining unit shown here. Enough straight-run naphtha is charged to dilute the visbreaker gasoline to maintain desired temperature control across the reactor. Fig. 1.

stances prevailing at the Rock Island plant. This resulted in a considerable savings in the cost of the unit.

The unit will be amortized in less than a year on the basis of tetraethyl lead savings and increased life of the Platformer catalyst.

Process flow . . . A simplified flowsheet for the Unifining unit is shown in Fig. 1. The visbreaker gasoline is the principal important stream; the volume is controlled at the visbreaker. Enough straightrun naphtha is charged to sufficiently dilute the visbreaker gasoline to maintain desired temperature control across the reactor. (The Unifining operation is exothermic.)

Electronic Instrumentation

Electronic instrumentation was selected for the new Unifining unit because of the excellent results which have been experienced to date with the pioneer installation[1 2 3] of electronic instrumentation in this refinery on the Platforming unit, initially placed on stream in July 1954.

The outstanding advantages of electronic over conventional instrumentation are numerous but five are particularly significant.

- Their higher performance factor probably justifies rating this advantage first in importance, as it means that the instrument is seldom out of service for repairs or adjustment. When repairs and the like are necessary, the sick instrument is merely unplugged and replaced with a spare.
- Reliability is improved because, if the recording feature becomes inoperative, the controller portion is not necessarily put out of action.
- The electronic instruments are extremely sensitive and respond rapidly. Thus the instrument commences corrective action immediately because of high sensitivity, or small dead band. Proportional and derivative functions, where used, may be set at much higher values (particularly derivative), without risking instability of control as evidence by hunting, overshooting, and other types of upsets attributable primarily to control action.
- A single universal electronic instrument can substitute for a number of instruments in differing services. This reduces to one or two the number of spare instruments which must be carried in inventory to provide the required margin of safety in event of instrument failure.

All that is necessary is to plug in the spare and install the required chart for the circumstances. This advantage is not exclusive with electronic instrumentation, but is very smooth from an operating standpoint.

- Electronic instruments are readily installed. A source of 110-volt a.c. power on the instrument panel and for controllers mounted locally in the field is all that is required. Linkage between measuring and control function and control panel instrument is by electric wires in a conduit usually carried in pipe racks.

Instrument air is needed only at the point of control.

Installation . . . This was relatively easy. Rock Island's instrument men already were familiar with the instruments, similar ones having been installed 2 years earlier on the Platforming unit. The conduit was already in and there was room enough to accommodate the additional wiring.

Even the constant-voltage transformer supplying power to the Platformer instruments had sufficient unused capacity to take care of the instruments needed to operate the Unifining unit.

The instruments are completely electronic up to the control valve itself. The process variables, such as flow, pressure, and temperature, are measured by transmitters and converted into electrical signals. These go to the recorder and controller on the board.

Flow and pressure are measured with transmitters which are similar to their pneumatic counterparts, while temperature can be measured with a resistance thermometer or thermocouple transmitter. All of the transmitted signals are identical, whether they are flow, temperature, or pressure.

Controller operation . . . The control device electronically compares the measurement voltage with a voltage established by the operator as he selects the desired control set point. It then endeavors to bring these two voltages into balance, generating a correcting output signal by powerful feedback amplifiers if there is a difference.

There are no moving parts in the controller, hence sensitivity is high and response rapid. The amplifiers are designed for great accuracy and stability. Adjustments and ranges are accurately (and repeatedly) calibrated in standard terms.

The controller's direct-current output signal actuates a power relay, or transducer, where, by means of a coil moving in a permanent magnetic field in proportion to the strength of the electric signal, an air pilot valve is operated to produce the standard pneumatic actuation pressure range of 3 to 15 psig. The controller is made direct or reverse-acting by the wiring on the plug-in connection, not internally in controller wiring.

The power relay also can be made direct or reverse-acting but only by

altering its internal wiring. The relay also may be made to supply full or minimum air pressure upon power failure in the controller, as desired, thereby causing the valve to completely open or close. The valve should be conventionally arranged to either completely open or close upon air-supply failure.

Valve operation . . . Valve action upon failure of control signal or actuation air is dictated by the process, but in many instances it might be most desirable to have no valve position change whatsoever. Such an arrangement is easily accomplished with an electric valve but it would be extremely difficult with a fully pneumatic system.

This electronic system does not directly actuate the valves it controls. Instead, air is used to position the valve plug in accordance with controller output as transduced by the power relay.

This is not too serious a compromise, since the power relay usually is mounted either on top of the valve motor itself, or at least within 6 ft. of it. There is thus a minimum of exposed tubing to become damaged and the coupling distance is so short under these conditions as to not interpose objectionable time lag.

A method of actuating a control valve without the use of air has been constructed as an experimental model. It now is under test in the Rock Island plant. To date it has exhibited far greater stability than a comparable pneumatic valve with positioner.

The valve is actuated by a small double-acting piston, power for which is supplied by a small motor-driven pump furnishing hydraulic oil under pressure. The oil pressure to the piston and direction of application are controlled by an electrohydraulic pilot valve which receives its signal from the electronic process controller.

In essence, this system substitutes hydraulic oil for air but in so doing eliminates many of the well-known disadvantages of pneumatic-valve actuation. Frequency-response tests of the experimental valve have been passed without difficulty and the sensitivity of response to an input signal has been very good. Life tests have been under way since last August and are expected to continue for some time.

Cold-weather operation . . . The electronic system with pneumatic valve actuation as installed at Rock Island is particularly adapted to cold-weather operation.

With the electronic instrument, only the power relay might need heating under the most severe conditions, as the air valve is of the nonbleeding self-cleaning type. Such heating has not been deemed necessary at Rock Island.

The electronic instruments are not readily upset nor do they easily lose calibration, even though they may have required the services of an instrument repairman during a turnaround. Thus they simplify putting a unit back on stream.

Going on Stream

After the new unit had been built by Rock Island personnel and the usual pressure tests and run-ins of pumps, etc., had been completed, catalyst was loaded into the reactor, the unit was dried out, hydrogen gas was admitted to the reactor, and warmup commenced. Finally, at 8 a.m. September 16, 1955, naphtha was cut in to the reactor and the signal given to attempt to get the Unifining unit on the line. Ninety minutes later it was in normal operation.

Previously in this refinery the Platformer has shown the same phenomenal ability to get on stream without a lot of instrument agony. It was on stream for initial startup within 3 hours and most controllers were on automatic within 40 minutes of the startup.

This is not the only time these instrument have paid off in smoothness of control. Some time ago the entire refinery was brought down for a turnaround. When the time came to go back on, trouble developed in all of the units which did not have electronic instrumentation. Emergency calls kept the instrument department so busy that it was 3 days before the chief instrument man suddenly realized there had been no trouble calls from the Platformer.

Checking, he found that the unit had gone on stream in a routine manner 2 days previously and the operators thought nothing of it.

TABLE 1—INSPECTION OF UNIFINING CHARGE AND PRODUCT

	Charge	Product
Gravity, °A.P.I.	62.8	64.4
Bromine No.	33.3	0.5
Total sulfur, per cent (A.S.T.M. Lamp)	0.137	0.008
Nitrogen, p.p.m.:		
Basic	2	<1
Total	6	2
Arsenic, p.p.b.	192	<1
PONA analysis, vol. per cent:		
Paraffins	50.1	61.1
Olefins	16.2	0.3
Naphthenes	27.5	34.3
Aromatics	6.2	4.3
A.S.T.M. distillation, °F.:		
I.b.p.	100	101
5 per cent	141	140
10 per cent	160	160
50 per cent	241	242
90 per cent	325	328
95 per cent	360	371
End point	399	394
A.S.T.M. gum, mg.	*10.1	0.6
Induction period, min.	250	>1,000
Reid vapor pressure, psi.	8.9	11.1
Octane rating, research:		
Clear	60.7	52.0
Plus 3 ml. TEL	74.9	73.3

*Oily.

Six controls . . . The Unifining unit has six electronic controls, the recorders, or recorder-controller as the case may be, are control-panel mounted according to the graphic system, with transmitters in the field at point-of-measurement.

These are indicated in Fig. 1. They include the surge-drum liquid-level recorder, flow control of straightrun gasoline, flow control of liquid charge to reactor, flow record of input hydrogen, back-pressure control of the high-pressure separator, and a flow record of treated product to Platformer feed preparation.

The other instrumentation of this unit, such as level controls in separators, reactor temperature and pressure, and the like, are for the most part conventional indicators or indicating controllers, some with alarms, and therefore are omitted from Fig. 1.

Table 1 shows the results which Rock Island achieves from Unifining. The data are form an actual run, typical of current operations. The charge stock shown is a mixture of visbreaker gasoline and straightrun naphtha, constituting a gasoline of normal boiling range as will be noted from the A.S.T.M. Engler distillation.

The charge rate admittedly is over design but shows no penalty when compared with results obtained when operating at or below design capacity. It is believed that the unit could handle up to 600 bbl. per day without undue difficulty if more heat exchange and cooling capacity were added.

Great improvement is notable in the Unifining product. The low bromine number shows that practically no olefins remain, which is confirmed by the hydrocarbon-type analysis. Some of the olefins in the charge apparently were cyclic, as indicated by the increase in proportion of naphthenes present in the product.

Arsenic, basic nitrogen compounds, and total sulfur are almost nonexistent.

The vapor-pressure differential shown is not considered a consequence of Unifining. There are some propane and butanes present in the incoming hydrogen stream from the Platforming unit which are absorbed by the charge to Unifining and at least some of which remain in the product.

References

1. Boyd, D. M., "What's the Score on Electronic Process Control?" The Oil and Gas Journal, Nov. 8, 1954, pp. 136-39.
2. Boyd, D. M., "Why Electronic Process Control?" presented before Instrument Society of America, Philadelphia, Sept. 15, 1954.
3. Boyd, D. M., "Is Automation the Answer?" World Petroleum annual refinery review, 1955.

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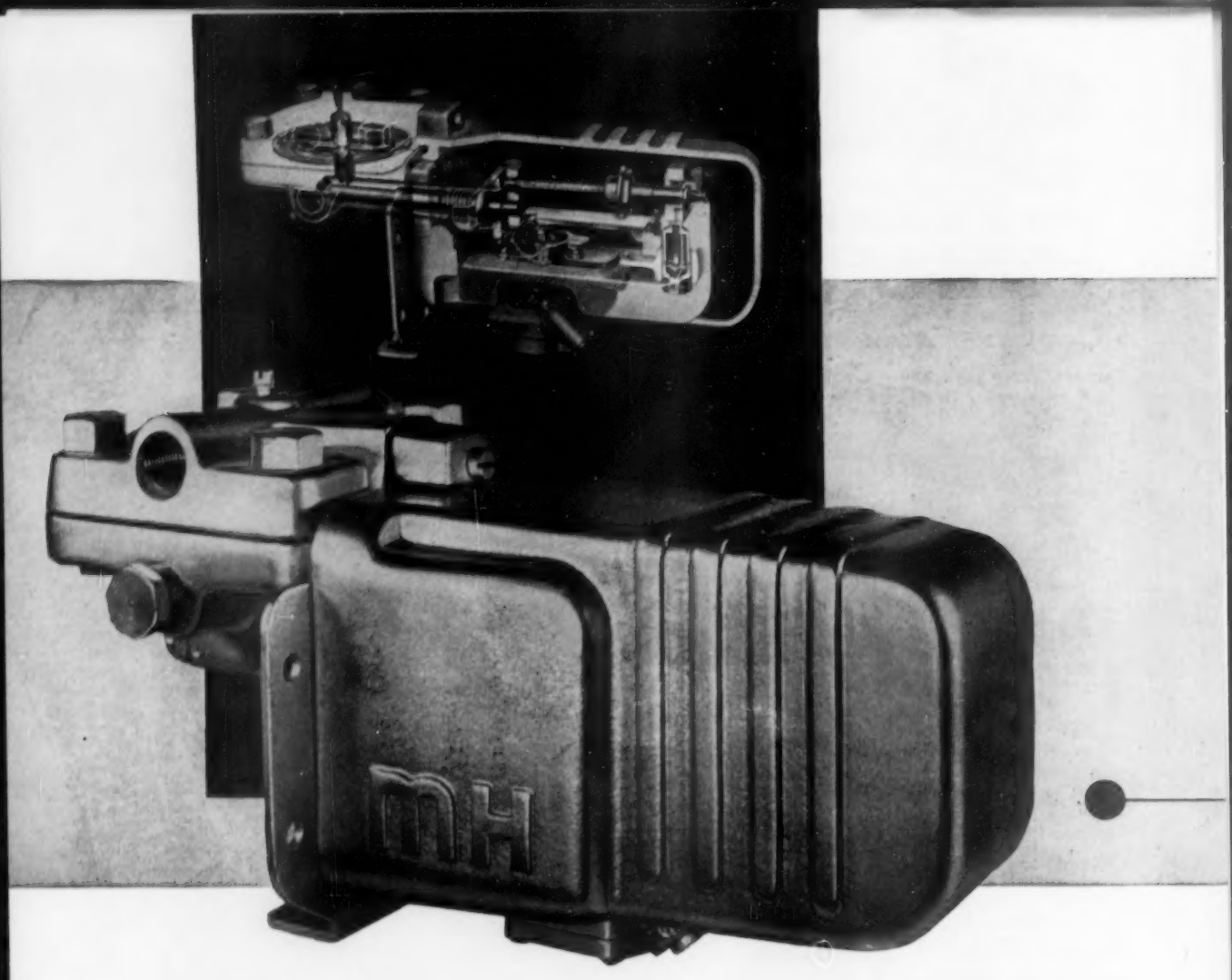

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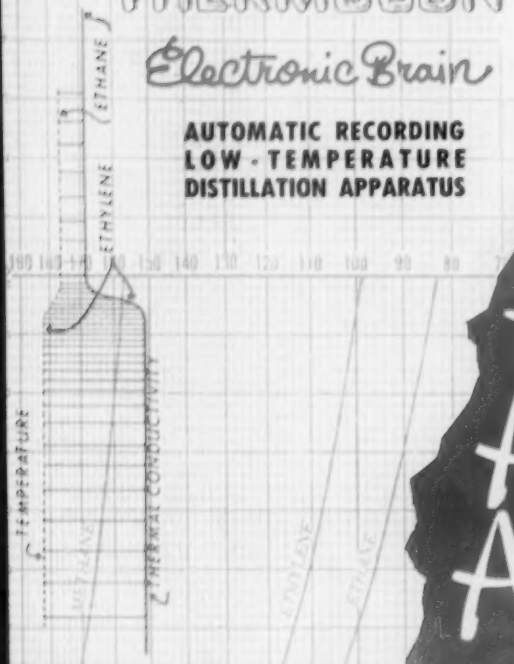

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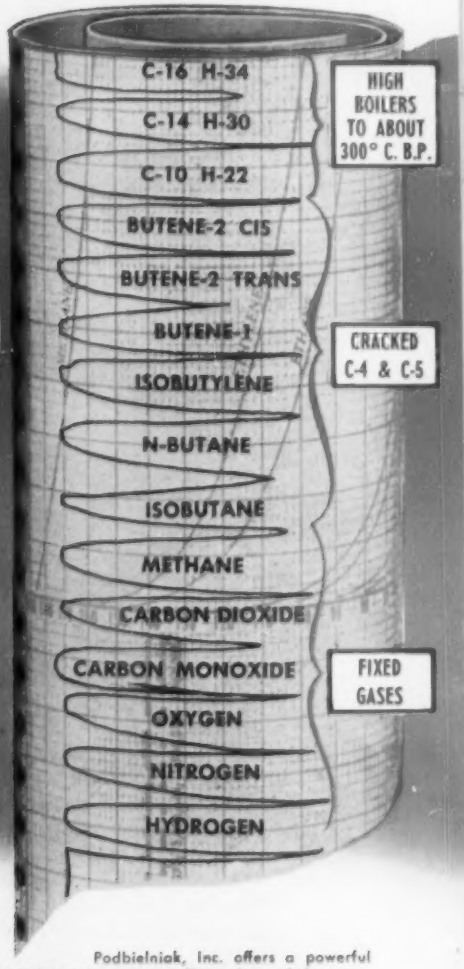

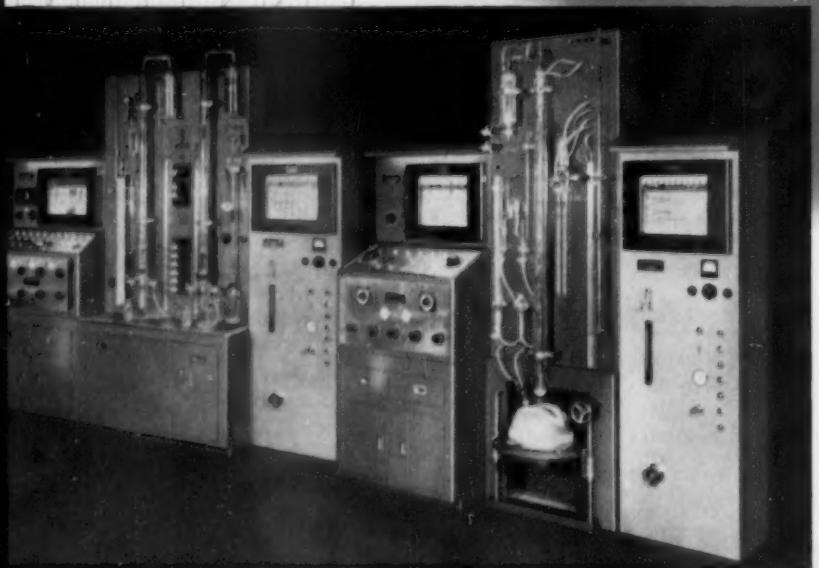

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B.P. Range: —150°C. to 100°C. Sample Size: 100 gas cc. to 100 cc. liquid.	B.P. Range: —50°C. to 350°C. Sample Size: 5 cc. to 12,000 cc. liquid.	B.P. Range: From H_2 up to 275°C. Sample Size: Approx. 1 cc. gas. Approx. 0.01 cc. liquid.

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Permanent-Type Dual Completions Find Favor

Part I of this two-part article appeared last week and described the features of the permanent-type dual completions now predominantly used. This part deals with the new use of retrievable production tubes with parallel tubing. Features of this type of installation are to allow perforation of both zones in the presence of a clean fluid and to make possible workover of either top or bottom zone without a rig being used.

by G. H. Tausch and John W. Kenneday

Part 2

THE problem of artificial lift in dual completions has been simplified by the use of parallel tubing strings. Fig. 4a shows the most elementary way to gas lift by the suspension of small tubing in each independent production tubing string.

Retrievable gas-lift valve mandrels with minimum outside diameters such as the sleeve-type mandrel have been successfully run in each independent production tubing string. When this method of artificial lift is utilized, the casing annulus is used as a common gas-lift gas source.

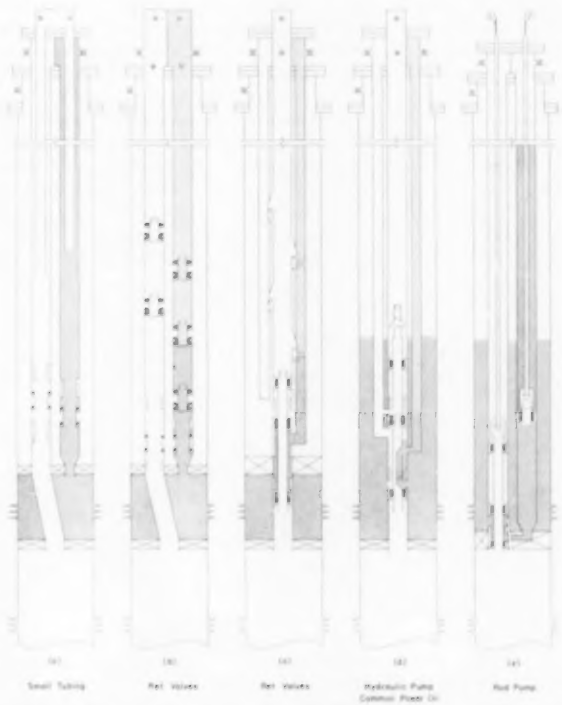
Although continuous and intermittent-type gas-lift operations have been carried on simultaneously with pressure-operated valves, the use of a common gas source highlights the need for efficient fluid-operated or tubing-pressure-controlled gas-lift valves. Such fluid-operated gas-lift valves should make practical the simultaneous gas lifting of both zones by intermittent-type operation. The use of sliding-sleeve, retrievable gas-lift valve mandrels on each string of production tubing is illustrated in Fig. 4b.

Recent design changes have made practical the use of offset-type retrievable gas-lift valve mandrels in installations of this type. The offset mandrels may be run independently if certain restrictions are met. As an example, with two strings of 2-in. tubing in 7-in. casing, the offset mandrels permit full-opening tubing to the lower zone but slightly restricted opening to the upper zone. The use of 1½-in. tubing to the upper zone or the use of smaller valves in the 2-in. tubing to the upper zone in this installation would permit full-opening production tubing to both zones.

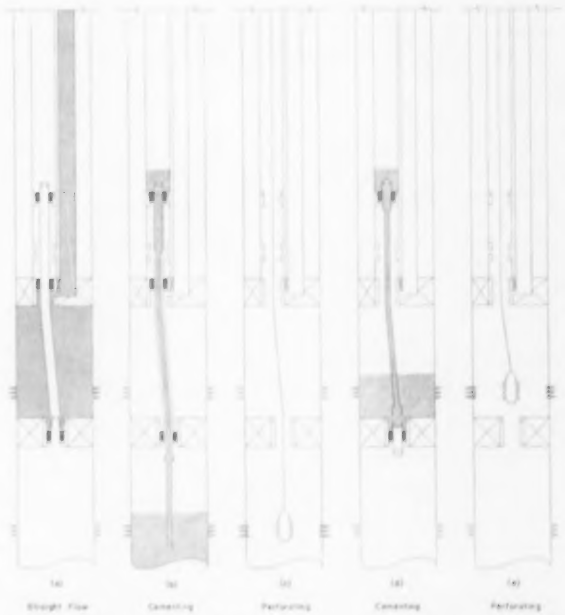
The independent-gas-source, gas-lift-type completion, shown in Fig. 4c, requires that the production tubing be clamped together. This uses the same offset-type mandrel previously illustrated with tubing and annulus flow paths. However, here the porting is such that production is up the large tubing and one small tubing string.

In this manner, both upper and lower zones have independent gas-lift gas sources to alternate gas-lift mandrels from the casing annulus and the other small tubing string. This installation leaves one tubing string full-opening.

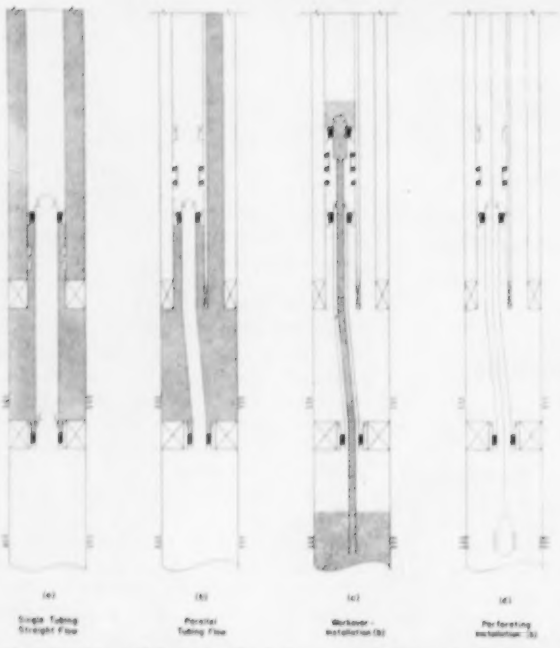
Other lift . . . Either hydraulic pumps or rod pumps can be used in independ-



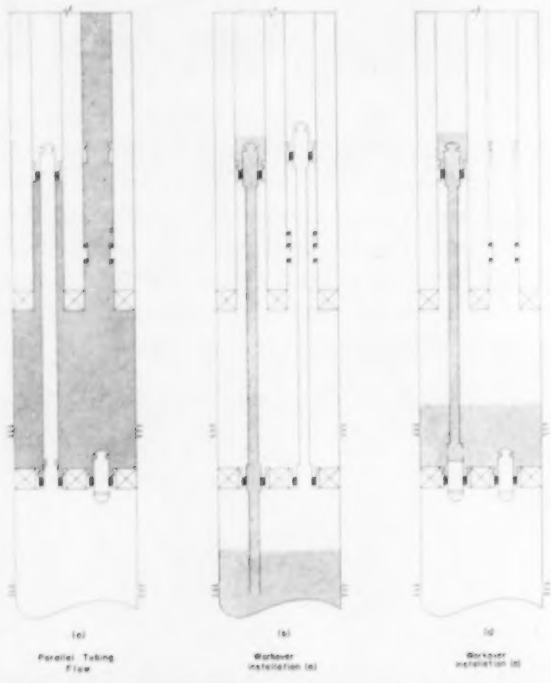
ARTIFICIAL LIFT methods where parallel tubing is used in dual completions include gas lift with common and independent gas source, fluid-operated gas-lift valves, tandem hydraulic pumps, and dual rod pumps. Fig. 4.



PRODUCTION TUBE, which is retrievable with a wire line, allows workover and perforation of both zones. When upper zones are perforated with the tubing gun the case is dissolved with caustic soda. Fig. 5.



ANY DUAL COMPLETION of the permanent type lends itself to the use of the retrievable production tube. When one tubing string is 2½-in. or larger, workovers can be performed through the tube. Fig. 6.



IDEAL DUAL COMPLETION for 5½-in. casing is two parallel 1½-in. tubing strings. A retrievable production tube produces the lower zone. This system permits maximum workover efficiency and high production of both zones. Fig. 7.

ent parallel-tubing installations or in tanden pump installations. The use of hydraulic subsurface pumps is attractive in some areas because these pumps may be connected together as a unit and utilize a common power supply. Fig. 4d is an installation of this type in which power oil is pumped down one small tubing string and production from the two zones is produced independently through the large tubing and an additional small tubing string.

A number of installations of this type have been completed with additional flexibility that allows hydraulic pumps connected in tandem to be used for lifting one zone while allowing the other zone to be flowed up the one tubing string. An installation commonly used by some operators and readily adapted to the permanent-completion technique is that of the parallel rod pumps as shown in Fig. 4e. This installation utilizes rod pumps as a means of artificial lift and requires that the rods and pumps be retrieved prior to permanent-completion operations.

Retrievable Production Tube

Both wire-line workover and ability to perforate both zones of a dual completion in the presence of clean fluids are frequently desired. This need is urgent for dual completions in fields where surrounding locations or terrain make the use of rigs objectionable or very costly. Because of the need, this type of dual completion has been developed

Seven wells have been completed as duals which permit permanent-completion operations on both upper and lower zones. This was accomplished by making tubing opposite the upper zone retrievable with a wire-line. A schematic illustration of this retrievable production tube is shown in Fig. 5a.

It has been desirable to tube all production because of well characteristics, and limited casing size has required the use of 2-in. and 1¼-in. parallel production tubing. Two packers are used to isolate the common gas-lift gas from the upper-zone production. The lower drillable packer is equipped with a polished bore of landing-nipple dimensions, and the upper packer contains the junction of the two production tubes. This joining of production tubing is necessary to permit crossover operations.

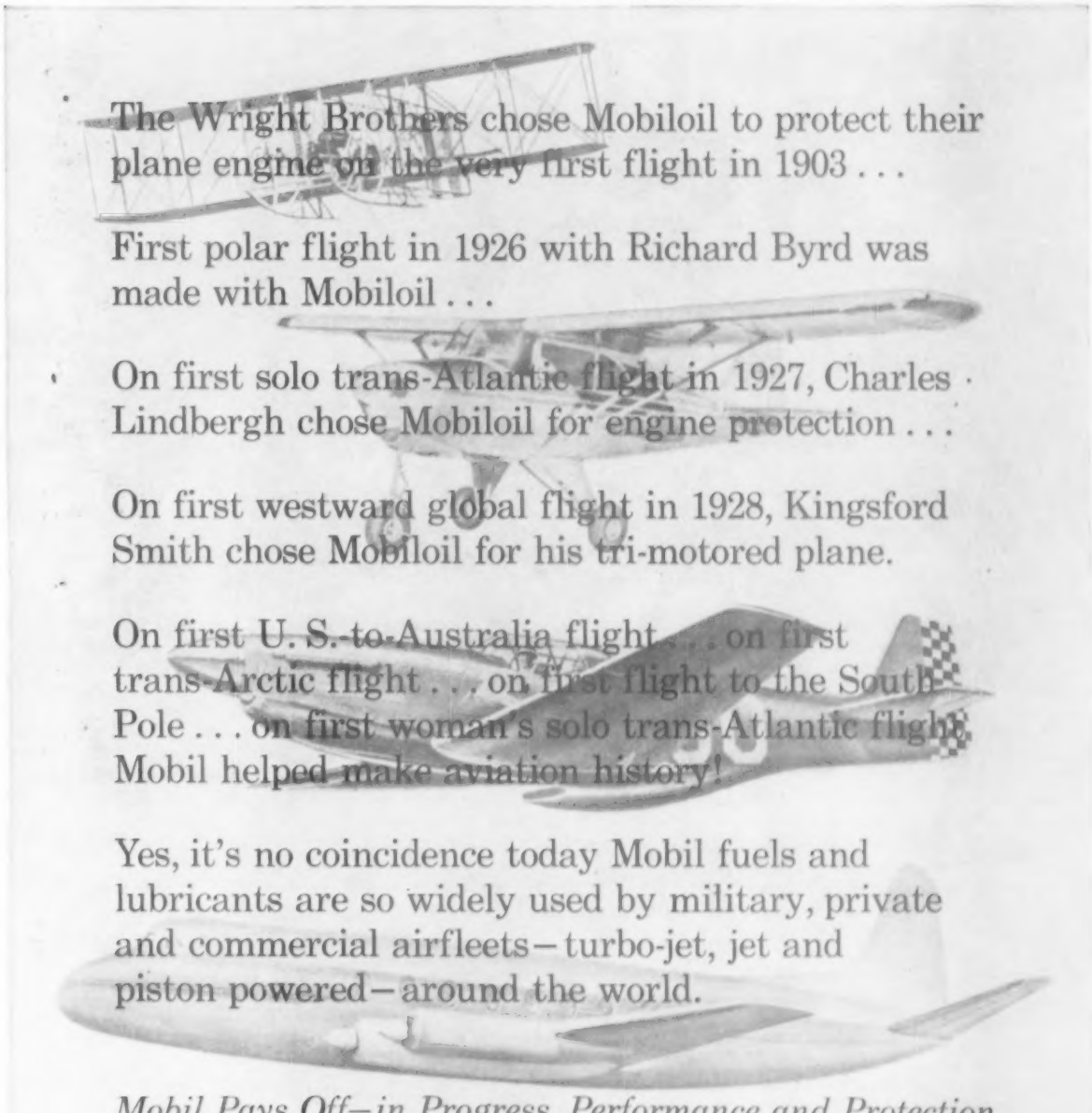
The upper end of the production tube is suspended and sealed in a landing nipple above the upper packer. The lower end of the tube contains Chevron packing and seals in the drillable lower packer. A safety joint is contained in the tube above the packing section so the tube will be parted at this point should the packing stick or be sanded in place.

Retrievable production tubes now installed are constructed of extra heavy 1¼-in. pipe. Flush-joint connections are used to facilitate removal if this tube becomes surrounded with sand. In actual practice, when production tubes have been retrieved, the safety joint has generally parted and a second trip with wire-line tools has been necessary to retrieve the packing section. Occasionally, small quantities of sand have been encountered around the packing section, causing the safety joint to part. However, the safety-joint shear pins were initially made too small so that the safety joint parted as a result of packing friction alone. This shear-pin difficulty has been cured, and tubes have been retrieved as a complete unit when not surrounded by sand.

A crossover choke, when necessary, may be built into the retrievable tube. One well is now completed for crossover flow.

Workover done . . . The lower zone of a dually completed well of this type has been reworked with a wire line to remove sand, to cement, and to perforate. To rework this well, the production tube was retrieved, gas-lift valves were exchanged for dummy valves, and a tubing extension was seated in the landing nipple above the upper packer. To isolate the upper zone, the tubing extension was constructed of concentric pipe through the section between packers. For this 2-in. tubing installation, the concentric extension section was made of 1¼-

It's no Coincidence...



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in. and ¾-in. aluminum pipes. The larger pipe contained Chevron packing elements to seal in the side-port nipple below the port to the annulus and in the drillable packer.

This setup, shown in Fig. 5b, isolated the upper zone and provided the two flow paths necessary for circulation between packers. After cementing, the tubing extension was removed, and a tubing-type perforator was run through the 2-in. tubing and drillable packer and was used to perforate the lower zone as shown in Fig. 5c.

. . . Workover of the upper zone of a well completed in this manner has not been necessary as yet. Such a workover may be accomplished, however, by placing a plug in the landing nipple machined into the bottom packer and by lowering an extension into place with the lower end of the extension positioned immediately above the plug. Equipment has been designed and tested, however, that permits the plug for the lower bracket to be run on the extension. The perforations in the extension above this plug are covered until the entire assembly is pressure-tested. With this device, the extension and plug may be removed in one operation. Fig. 5d shows the extension in place for cementing or sand-exclusion operations on the upper zone.

Upper zones have been perforated with the tubing gun on several occasions as illustrated in Fig. 5e. In each instance it was necessary to dissolve the gun case with caustic soda prior to replacing the production tube. It is interesting that sand-production problems have not occurred since perforating the upper zones in clean water. In previous wells when drilling mud was used as a perforating fluid, tubing was sand-cut opposite the upper zones.

Gas lift used . . . In five of the wells presently completed, retrievable offset-type gas-lift valve mandrels are used for artificial lift. The 1¼-in. and 2-in. tubings pass through each mandrel, and the valves are retrievable through the 2-in. tubing. This is the same offset mandrel previously illustrated, only the two small conduits through the mandrel are merged in common end connections to the 1¼-in. tubing. Fluid-operated gas-lift valves lift the production through 1¼-in. tubing, and pressure-operated valves lift production through the 2-in. tubing.

The simplicity of the retrievable production tube makes its use applicable in almost any type of permanently completed dual. Artificial-lift equipment is not altered; only the tubing opposite the upper zone is made retrievable. Although only the seven previously mentioned wells have been completed in this manner, Figs. 6a and 6b illustrate the installation of this tube in a single-tubing and a parallel-tubing well.

When 2½-in. or larger production tubing is used, the retrievable production tube may be made of 1½-in tubing. Minor modifications in the production tube hanger will then permit the passage of 1½-in. tubing tools as shown in Figs. 6c and 6d. In this situation the production tube may remain in place during lower-zone workovers.

Development Need

The advantages of independent parallel tubing strings, independent artificial apparatus, and retrievable production tube, coupled with the presence of old wells having 5½-in. casing which can be recompleted as duals, creates a need for a slightly different dual installation which will combine all the previously mentioned advantages. One and one-half-inch tubing is the optimum-size tubing since two strings of this size can be successfully run in 5½-in. casing. Previous work on slim-hole completions has proved that it is possible to gas-lift over 700 bbl. of salt water per day from a 5,000-ft. high-fluid-level well with 1½-in. tubing. A special drillable lower packer, retrievable upper packer, and retrievable gas-lift valve mandrels have been designed to permit their use in this type dual completion.

After the equipment was constructed and tested, a well was completed in this manner to evaluate the use of 1½-in. tubing, fluid-operated retrievable gas-lift valves, and wire-line recompletions on both upper and lower zones. Fig. 7a shows this installation as set in a 5,000-ft. well.

Use of 1½-in. tubing prohibits the use of concentric bypass between packers during the reworking of the lower zone. Therefore, the lower drillable packer was constructed with two receptacles to receive the packing elements on the lower end of an extension run through each tubing string.

While the well is producing, the retrievable production tube is suspended and sealed in one tubing string and the lower end is sealed in the lower packer to conduct production from the lower zone. A plug is then run through the other tubing string and sealed in the lower packer.

How it's used . . . Should sand production be experienced, a tubing extension with telescoping joints may be run through the tubing open to the upper-zone production. Opening a communication port immediately above the upper packer in this tubing string allows the sand to be reverse-circulated out by fluid pumped into the casing annulus. This would leave the upper zone clean to permit removal of either the plug or the retrievable production tube.

When workover operations of the lower zone are performed, one extension is run through the lower packer and sealed in this packer. The second extension is run through the other tubing string and also sealed in the lower packer. The use of two extensions provides sufficient flow paths for fluid circulation and completely isolate the upper zone during workover operations on the lower zones. This workover installation is schematically shown in Fig. 7b.

After all operations utilizing the tubing extension have been performed, the extensions may be retrieved and a 1⅜-in. o.d. tubing-type perforator may be run through the tubing and through the lower packer to reperforate the proper interval for lower-zone production. As yet, no workover operations of this type have been performed. However, the extension and lower packer plug have been run and retrieved and pressure-tested to prove the practicality of this operation. The bore passing through the lower packer is 1 7/16-in. i.d., while the bore for the plugs is only 1¼-in. i.d. so that each of the two receptacles is selective by its difference in diameter.

Reworking upper zone . . . Provisions have also been made for an upper-zone workover. Possibly the simplest method for reworking the upper zone is the use of an extension suspended in one tubing string and sealed off in the lower packer with a perforated section immediately above the packing and a plug in the other receptacle of the lower packer as shown in Fig. 7c.

It is possible also to again run two extensions, both sealing in the lower packer and one having a perforated section above the lower packing and the other having a perforated section at the top of the extension. With either upper or lower-zone workover, both production tubing strings may be used as flow paths, and the casing annulus may be left sealed.

As soon as adequate artificial-lift tests have been performed to evaluate simultaneous gas lifting of both zones under a variety of conditions, both upper and lower-zone workovers will be performed to evaluate these operations.

At the present time the upper and lower packers are separated by approximately 25 ft. This distance will be increased to approximately 200 ft. in the later stages of these testing operations to prove the practicality of this greater distance between packers.

(References appeared at end of Part 1.)

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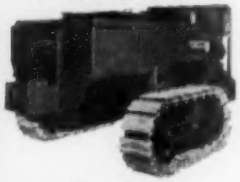

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Filtering Trace Metals From No. 6 Fuel Oil—2

by C. H. Shields, Jr.

A MODEL continuous rotary vacuum filter was used for removal of trace metals in No. 6 fuel by filtration as described in Installment No. 1.

In a series of tests using diatomaceous filter aids as precoat materials, continuous rotary vacuum precoat filtration reduced sodium content of the test No. 6 fuel oil to an average concentration of 3 p.p.m. from original concentrations of 75 to 217 p.p.m. Specific values after treatment covered the range of 1 to 10 p.p.m.

In the same tests, calcium content was reduced to an average concentration of 39 p.p.m. from original concentrations of 100 to 250 p.p.m. Individual results covered the range of 26 to 51 p.p.m.

Some tests also were made in which a silica-alumina clay product was used in precoats alone and in combination with diatomaceous filter aid in effort to remove additional calcium by adsorption. However, there was no significant reduction below the concentrations obtained in other tests. Changing the precoat vehicle had no apparent effect on metal removal.

Results of combined analyses of a typical No. 6 fuel oil before and after filtration are given in Table 1.

No change was observed in metal-removal efficiency due to changes in precoat thickness during periods in excess of 12 hour operation on the same precoat cake.

Filtered Oil Flow Rates

Average oil flow rates and earth usage are given in Table 2 for tests in which diatomaceous filter aid was used to precoat material.

Addition of 0.2 per cent precoat cake shavings, and 0.2 per cent clay to the feed had no obvious effect on metal removal, and only slightly affected the flow rate of filtered oil. Of practical value, however, was the fact that during these tests with admixture, no visible cake cracks were observed, even when relatively major changes were made in drum speed and knife cut.

Related data on oil losses by retention on diatomaceous-earth-cake shavings were calculated for various operating conditions and included in Table 2. Figures are based on experimental data which showed oil content to average 122 per cent of the weight of dry cakes in the shavings, with only slight differences attributable to changes in drying rate as drum speed was varied.

What Tests Showed

The results of the present tests indicate that the filtration process can remove most sodium and lead, some calcium, and certain other trace elements from the batch of No. 6 oil used in these tests. Similar results also were obtained in tests using several other No. 6 fuel oils in addition to the one for which data are given. The oils treated thus far constitute a rather limited sampling of an extensive field, and the results to be expected with other No. 6 fuel oils should, of course, depend upon the extent to which the presently tested oils are representative of No. 6 fuel oils in general.

Vanadium . . . With regard to the persistance of vanadium in the filtered oil, there is evidence to indicate that the element exists as an organic complex in the oil.[12 13 14] A portion of the calcium in the oil also tends to be elusive, but the reason for this is not yet clear. Attempts to remove these elements from practical quantities of oil through use of high-efficiency adsorbents have so far been hampered by the nonporous nature of available material, as well as its low capacity due to fouling of available surfaces by heavy hydrocarbons. Experiments are being continued along these lines, and along the line of reduction of metal content by reaction with chemical addition agents followed by filtration. Up to the present time, some success has been achieved in removing calcium more completely, but vanadium content has been only slightly reduced.

Concerning the values of filtered-oil flow rate obtained, it should be expected that higher rates will be obtained using a commercial-size hooded filter under the same conditions, since cooling of the cake on the present filter during the drying and shaving stages is certain to have lowered the flow rate of the oil during the initial stages of the submerged filtration cycle. This thought appears to be borne out by the data of Table 2, which show a lower flowrate for the 5-minute drum-revolution tests at 0.002 in. cut per rev-

TABLE 1—RESULTS OF ANALYSES OF A NO. 6 FUEL OIL

	P.p.m. Before filtration	P.p.m. After filtration
Na	217	2
Ca	250	48
Ni	20	14
Al	23	4.1
Fe	47	20.5
Pb	13.6	2
Cr	2.1	2
Mg	18	5.8
V	38	31.8
Cu	8	2
Zn	16	16
Ag	1	1
Mn	2	2
Ti	2	2
Sn	2	2
Total ash	1,200	260
Sediment, per cent	0.0860	0.0097

TABLE 2
Summary of Operating Data for Treatment of Oil by Filtration Using Model Rotary Vacuum Precoat Filter

Drum speed, min./rev.	Knife cut, i.p.r.	Filt. oil flow rate g.p.h./sq. ft. area	Precoat usage, lb./gal. filtrate	Retained oil loss, gal./gal. filtrate
5	(*)	2.14	0.0029	0.00044
3	0.001	2.97	0.0104	0.00159
5	0.002	2.67	0.0139	0.00211
3	0.002	3.48	0.0178	0.00271
1	0.001	3.91	0.0238	0.00363
1	0.002	5.50	0.0338	0.00515

*Cut of 0.001 in. depth taken for one revolution at 15-minute intervals.

Author is chemical engineer with General Electric Co., Schenectady, N. Y. From paper presented at A.S.M.E. Chicago meeting.

"An important question with regard to the reliability of filtration, assuming an oil amenable to the process, appears to be the possibility of serious cracking of the precoat cake during operation. This introduces the danger of using contaminated oil. Although some cracks did appear during test runs, the results of sodium analyses indicate that penetration of cake was never complete."

olution than was obtained with the 3-minute drum revolution at only 0.001-in. cut per revolution.

The common practice of increasing flow rate by heating the feed oil to lower viscosity should be considered with caution in vacuum filtration of No. 6 fuel oil at temperatures approaching 212° F., since water may flash from the oil within the cake causing interior pin holes and fissures. These would, of course, result in decreased efficiency of metal removal when the cutting knife penetrated to the affected portions of the cake. A pressure filter probably would be required to filter at temperatures at or above 212° F.

Cracking . . . An important question with regard to the reliability of filtration, assuming an oil amenable to the process, appears to be the possibility of serious cracking of the precoat cake during operation. This introduces the danger of using contaminated oil. Although some cracks did appear during test runs, the results of sodium analyses indicate that penetration of the cake was never complete. The cracking which did occur, was probably due to one or more of the following factors:

1. Changes in the extent of cake drying caused by changing drum speed and knife cut.

2. Expansion and contraction of the cake due to changes in temperature and oil content as it emerges from and reenters the feed oil bath of the open filter tank.

3. Forced changes in cake density due to difference in viscosity of precoat vehicle and raw No. 6 fuel oil.

4. Aggravation of the foregoing factors by the rim height, short drum length, and relatively small drum diameter.

For the most part, the causes of cracking which have been cited or may be avoided using a commercial-size hooded filter under actual operating conditions. Instant repair of minor cracks which might still possibly occur, could be insured by use of shavings in the feed as previously mentioned, or by use of a slurry rained on the exposed part of the cake from standard wash bars.

TABLE 3—COSTS OF PRECOAT EARTH AND OIL LOST BY RETENTION IN PRECOAT SHAVINGS§

Drum speed, min./rev.	Knife cut, in./min.	Filt. oil flow rate, g.p.h.-sq. ft. area	Precoat* earth cost (cts./gal. filt. oil)	Retained† oil cost (cts./gal. filt. oil)
5	(‡)	2.14	0.0116	0.0031
3	0.001	2.97	0.0417	0.0111
5	0.002	2.67	0.0557	0.0148
3	0.002	3.48	0.0713	0.0190
1	0.001	3.91	0.0951	0.0254
1	0.002	5.50	0.1352	0.0361

*Based on diatomaceous earth filter aid cost of 4 cents per pound. †Based on No. 6 fuel oil cost of 7 cents per gallon. ‡Cut of 0.001 in. depth taken for one revolution at 15-minute intervals. §Calculated from experimental data on filtration of a No. 6 fuel oil using model continuous rotary vacuum precoat filter.

To illustrate the practical possibilities of the filtration process, figures on throughput of oil based on a shavable cake thickness of 1 in. were extrapolated from experimental flow-rate data of Table 2. These figures predict an operating cycle of up to 249 hours per inch of shavable precoat, during which time as much as 533 gal. of treated oil would be passed by each square foot of filter area. The usage figures of Table 2 were converted to cost figures as shown in Table 3, for purposes of preliminary economic evaluation. Results indicate that the process is economically feasible.

At present, work is being continued with the aim of increasing the efficiency of the process, and determining if the treatment may be applied to No. 6 fuel oils in general.

Conclusions

1. Precoat filtration through diatomaceous earth can reduce the sodium concentration in No. 6 fuel oil to about 2 p.p.m. from original concentrations of over 200 p.p.m.

2. Calcium, iron, aluminum, lead, and magnesium, as well as sediment and total ash are substantially reduced. Less success, however, has been obtained in reducing vanadium content.

3. Present data indicate that the process using a continuous rotary precoat filter is economically feasible.

Bibliography

1. "Properties of Residual Petroleum Fuels," by W. Sacks, A.S.M.E. Paper No. 53-F-1.

2. "Residual Fuel-Ash Corrosion," by B. O. Buckland, C. M. Gardiner, and D. G. Sanders, A.S.M.E. Paper No. 52-A-161.

3. "Attack on Heat Resistant Steels of Vanadium—Containing Oil Ashes," by P. Schapfer, P. Amgwerd, and H. Preis, Schweitzer Archiv fur Wissenschaftliche Technische, Vol. 15, 1949, pp. 291-200.

4. "Reduction of the Vanadium Content of Residual Petroleum Fuels by Solvent Precipitation," by W. Sacks, Canadian Jour. of Tech., Vol. 29, 1951, pp. 492-495.

5. "Refining Residual Fuels," by G. H. Reman, U. S. Patent No. 2493596 to Shell Development Co., January 1950.

6. "How Residual Fuels Are Treated for Use in Diesel Engines," by F. P. Downing, F. W. Keith, Jr., P. W. Wilder, and F. H. Smith, Marine Engr., Vol. 58, April 1953, pp. 59-63.

7. "Application of Additives to Fuel Oil and Their Use in Steam Generating Units," by J. B. McIlroy, E. J. Holler, Jr., and R. B. Lee, A.S.M.E. Paper No. 52-A-160.

8. "Use of Residual Fuels in Gas Turbines," by P. Draper, A.S.M.E. Paper No. 52-A-127.

9. "Burning Bunker Oil in Diesels," by E. B. Rawling and E. D. Newell, Trans. S.N.A.M.E., Vol. 59, 1951.

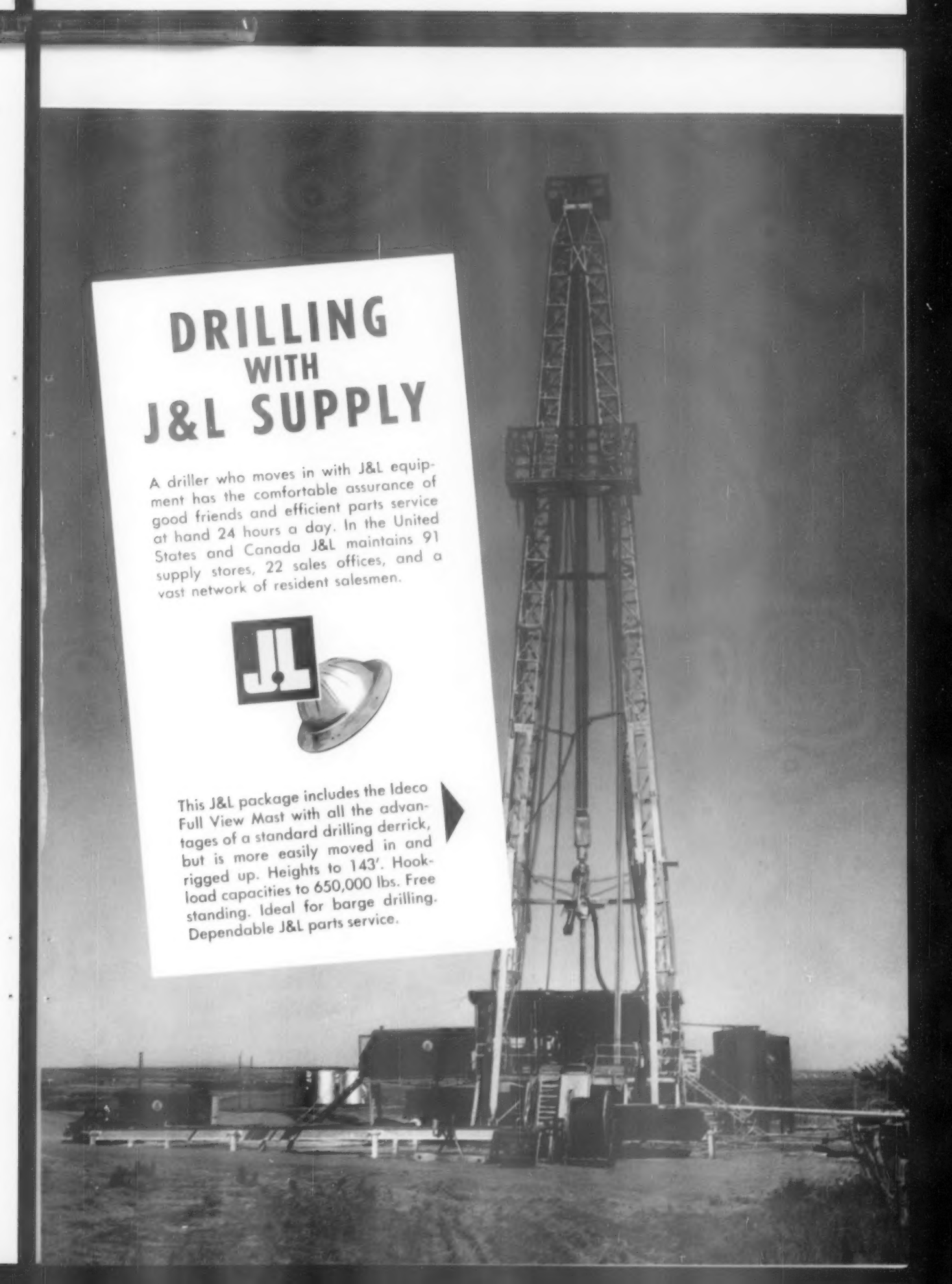
10. "Pilot Unit Studies in Filtration of Refinery Emulsions and Separator Sediments," by E. Q. Camp and C. Phillips, The Oil and Gas Journal, Vol. 44, No. 46, 1950, pp. 214-215.

11. "The A B C of Oliver Filtration," by G. O. Hillier, Oliver United Filters, Inc., New York, 1943.

12. "The Metallic Elements in Residual Fuel Oils," by F. H. Garner, S. J. Green, F. D. Harper, and R. E. Pegg, Jour. of the Inst. of Pet., Vol. 39, No. 353, 1953, pp. 278-293.

13. "Chemical State of Vanadium in Santa Maria Valley Crude Oil," by D. A. Skinner, Ind. and Eng. Chem., Vol. 44, No. 5, 1952, pp. 1159-1165.

14. "Interfacial Activities and Porphyrin Contents of Petroleum Extracts," by H. N. Dunning, J. W. Moore, and M. O. Denekas, Ind. and Eng. Chem., Vol. 48, No. 8, 1953, pp. 1759-1765.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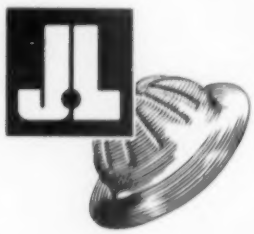

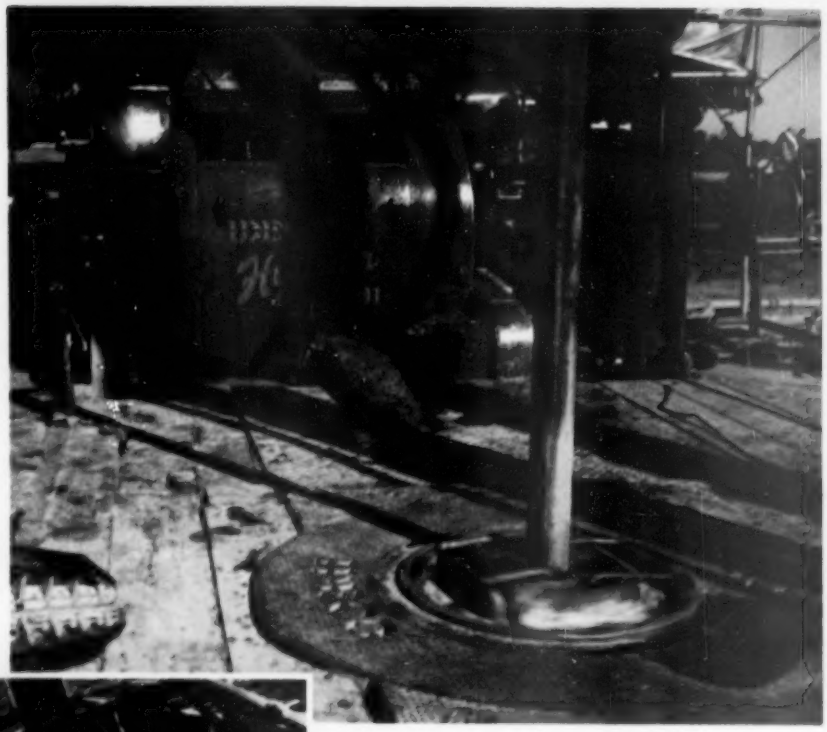

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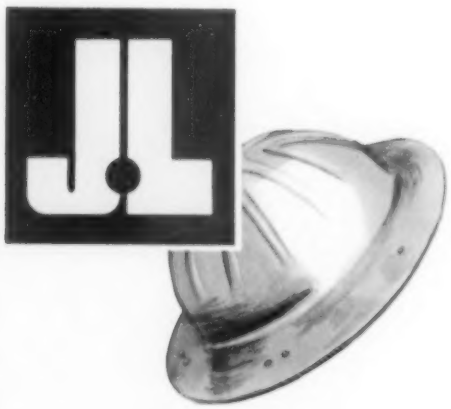

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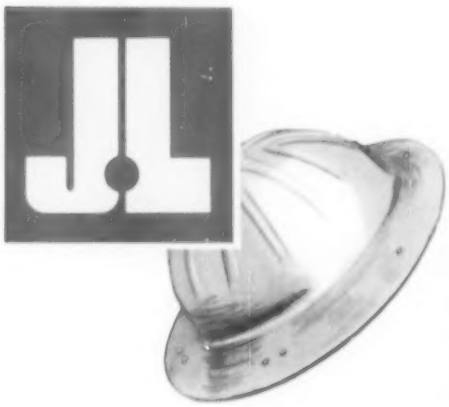

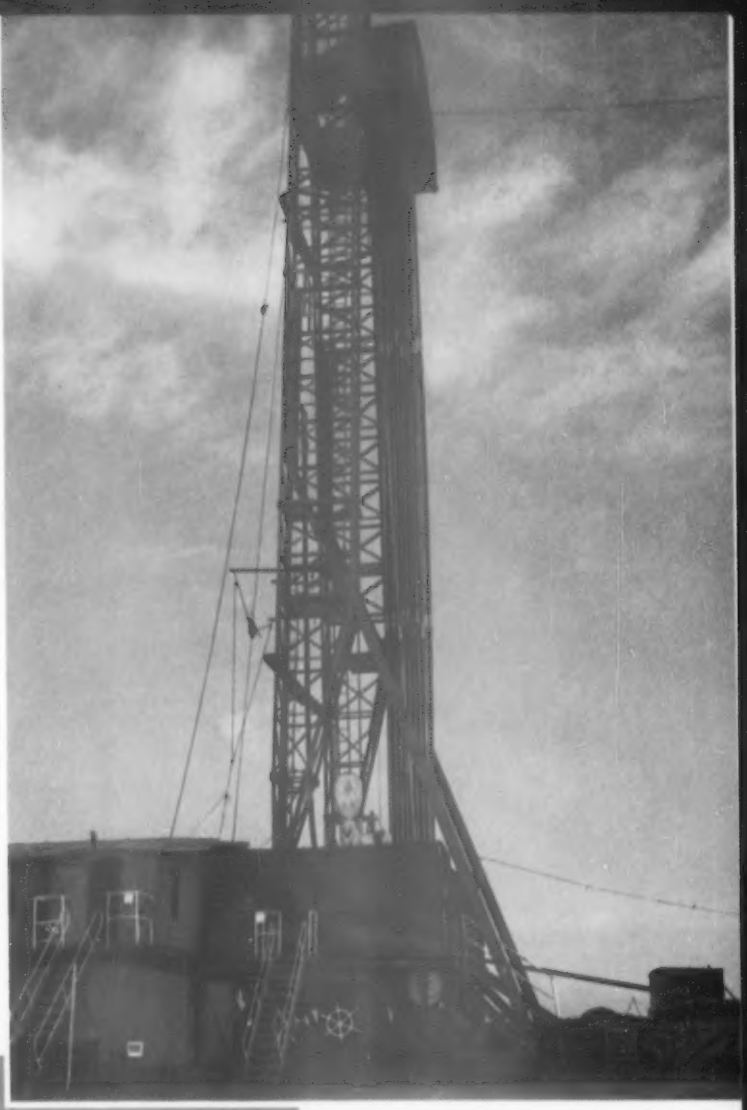

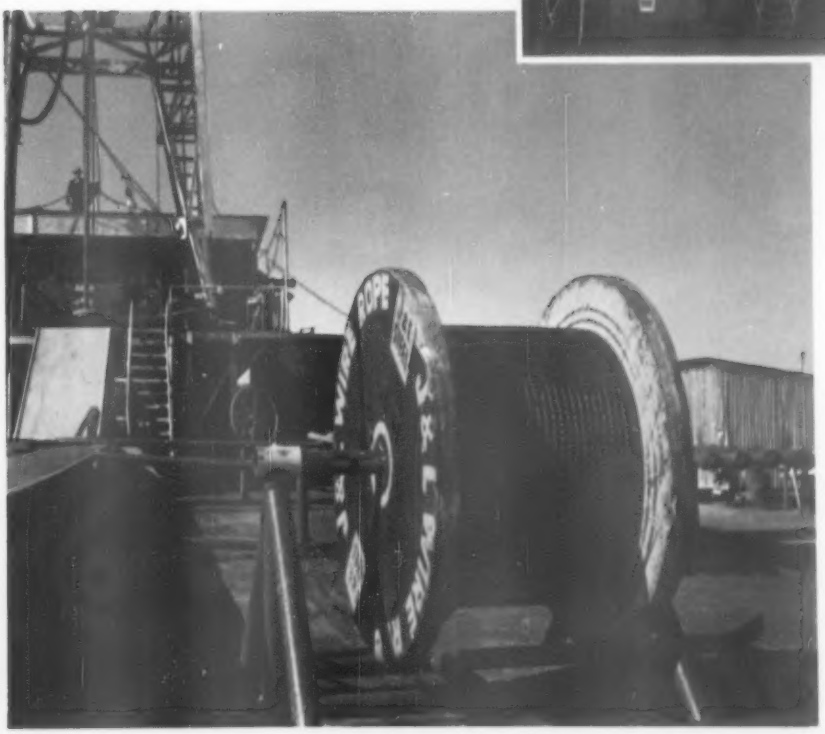

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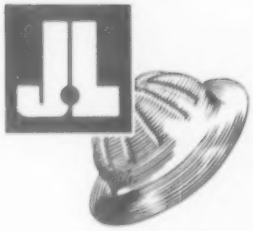

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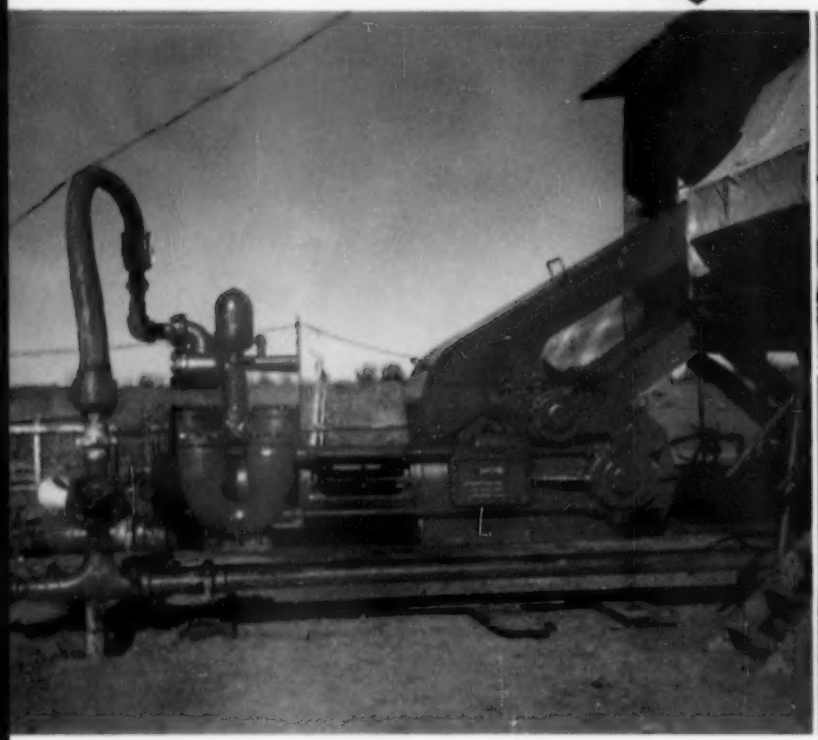

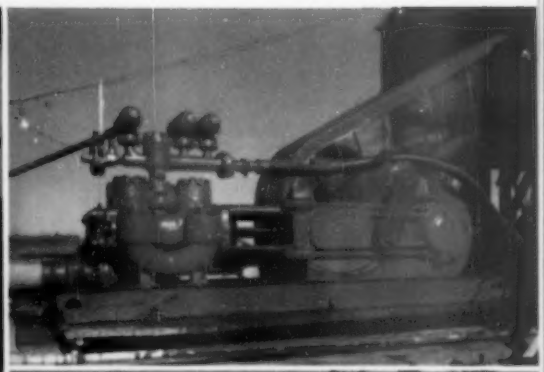

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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—49

The A, B, C's of Instrumentation—2

THE functions of instrumentation were pointed out in the first installment, in last week's issue, and some points concerning flow measurement were taken up. Some additional material on flow measurement and some introductory concepts of pressure measurement are considered here.

The most common and most flexible of rate of flow metering for fluids is to measure the differential pressure created by the velocity of the flowing fluid usually through a restriction. Flow rate is a square-root function of the differential pressure which may be measured by any of the instruments to be described later under differential-pressure measurement. The most used restriction device is the square-edged, thin-plate orifice (Fig. 5). Orifice characteristics are well known and predictable. Calculation and construction of new plates are easily, cheaply, and quickly accomplished and accuracy is high, provided all the flowing conditions are accurately known and the work carefully executed.

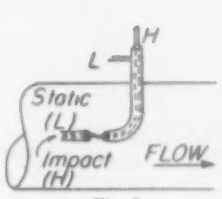


Fig. 9

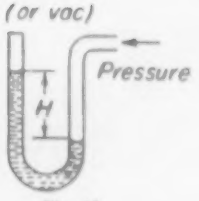


Fig. 10

Fig. 11

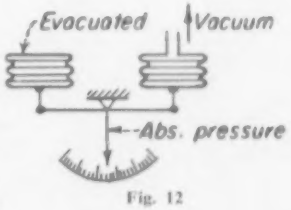


Fig. 12

Fig. 13

Fig. 14

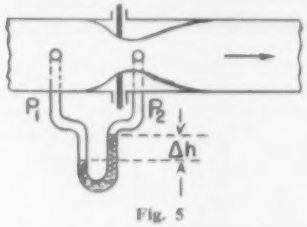


Fig. 5

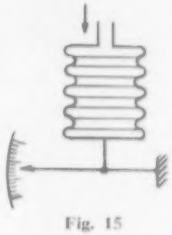


Fig. 15

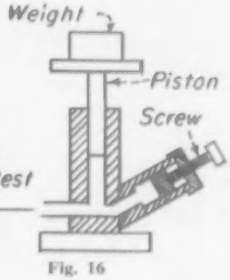


Fig. 16

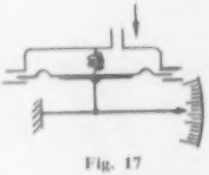


Fig. 17

Three other devices, the flow nozzle (Fig. 6), the flow tube (Fig. 7), and the venturi tube (Fig. 8) have lower pressure losses but are much more expensive and are not readily changed to fit new conditions. The Pitot tube (Fig. 9) is easily installed in large ducts, but its flow coefficients cannot be predicted accurately.

Pressure

Pressure, vacuum, or a difference between two pressures, has been measured for a long time with the common U-tube manometer (Fig.10). The plain glass U-tube still has many uses along with the more elaborate metal manometers used for higher pressures.

Absolute pressures, unlike "gage pressures" must be taken without interference from changes in atmospheric pressures. The mercury barometer (Fig. 11) reads atmospheric pressure with respect to absolute. The absolute pressure gage (Fig. 12) has, in addition to the measuring bellows, an evacuated bellows to discount the effect of atmospheric pressure changes.

Gage pressure readings are taken with reference to atmosphere, either above or below (vacuum). These are usually taken with the ordinary Buordon tube (Fig. 13), the spiral (or helix) (Fig. 14), the bellows (Fig. 15), or the diaphragm (Fig. 16) types of gages. Low pressures may be taken with any of the types listed for differential pressure service.

Dead-weight testers (Fig. 17) in which a known weight is raised by a piston of known area to balance a definite pressure, are used for precise calibration of pressure gages.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

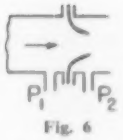


Fig. 6

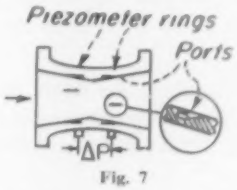


Fig. 7

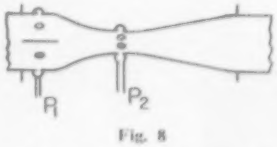
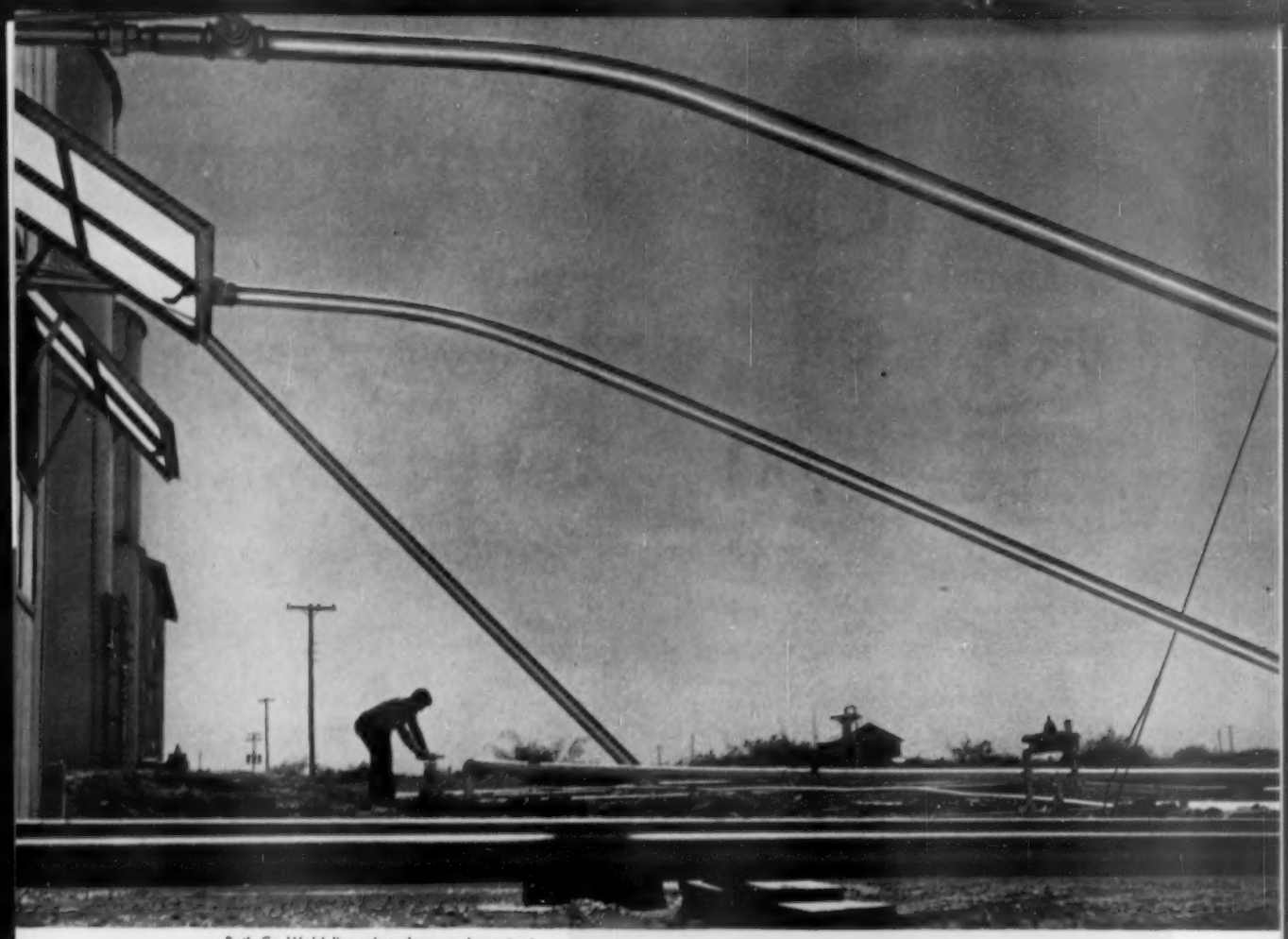


Fig. 8



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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Capacity of Vacuum Towers

In vacuum plants for producing catalytic charge stock, can you determine the capacity of the vacuum tower by the formulas given in your Petroleum Refinery Engineering? We do not seem able to attain such capacities.—W.P.F.

When operating vacuum towers for catalytic feed stock, using wire-mesh mist extractors below the catalytic gas-oil drawplate and when protecting the wire mesh from entrainment by means of at least one bubble tray, the formula (Equation 42) given on page 437 of the third edition of Petroleum Refinery Engineering appears to work satisfactorily:

$$W = C\,[d_2\,(d_1 - d_2)]^{1/2} \quad (42)$$

in which "W" is the pounds handled per square foot-hour, "d_2" and "d_1" are the densities of the vapor and the liquid at tower conditions, and "C" is a constant. Towers which are operating for penetration asphalt as a bottom product as well as clean catalytic charge stock are able to operate at the rates of Equation 42 (see above). Towers that produce only a "flux" bottoms can operate at even higher capacities (one plant at 26 per cent above Equation 42). Table 1 indicates the performances of a few plants and in examining such comparisons it must always be remembered that the plants may not be operating at full capacity. In general, the operations of Table 1 produced catalytic charge stocks having carbon residues below 0.4.

In addition to the regular factors which affect capacity, a vaporizer temperature above 800° F. appears to cause such violent vacuum decomposition (see Reference 12) with its attendant foaming that only a very low capacity can be attained. Not only does the foam tend to escape with the side-draw products but it quickly plugs wire-mesh demisters causing excessive pressure drops or high vaporizer pressures.

References

1. Gaumer, G. H., Case History, Tide Water Associated . . ., The Oil and Gas Journal, Dec. 28, 1953, p. 70.
2. Oberling, H. J., Case History, Aurora . . ., The Oil and Gas Journal, Dec. 28, 1953, p. 72.
3. Anon., Vacuum Unit Produces Exceptionally Clean Gas Oil, The Oil and Gas Journal, Feb. 9, 1953, p. 113.
4. Russell, J. W., Case History, Ohio Oil Co. . . ., The Oil and Gas Journal, Nov. 23, 1953, p. 94.
5. Fisher and Burger, Case History, Sinclair Refining Co. . . ., The Oil and Gas Journal, Nov. 23, 1953, p. 96.
6. Anderson, C. O., Case History, Rock Island Co., Indianapolis, The Oil and Gas Journal, Nov. 23, 1953, p. 100.
7. Corlew, J. S., Case History, Sinclair . . ., The Oil and Gas Journal, Nov. 2, 1953, p. 82.
8. Orr, A. R., Case History, Cosden . . ., The Oil and Gas Journal, Nov. 2, 1953, p. 84.
9. Fourer, H. S., Sinclair Refining Co., Marcus Hook, The Oil and Gas Journal, Nov. 2, 1953, p. 86.
10. Stormont, D. H., Case History, General Petroleum Corp. . . ., The Oil and Gas Journal, Nov. 2, 1953, p. 87.
11. Naugle, J. M., Vacuum Pipe Still Supplies 23,000 Bbl. per Day Gas Oil . . ., Pet. Processing, Dec. 1949, p. 1346.
12. Nelson, W. L., Petroleum Refinery Engineering, third edition, p. 596, McGraw-Hill Book Co., Inc., 1949.

TABLE 1—CAPACITIES OF A FEW VACUUM PLANTS BASED ON THE LOWEST TRAYS

Feed	Vaporizer		Value of "C" in Eq. 42		
°A.P.I.	Temp. (°F.)	Pressure (mm.)	Theory	Actual	Approx. lb. per sq. ft.-hr.
20.2	695	30.0	650-775	778	778
7.7	768	20.5	630-730	*540	*365
20.5	760	18.0	610-700	710	475
				†680	†461
21.0	760	25.0	640-730	547	509
	730	50.0	640-730	880	915
19.0	750	40.0	630-730	688	690
18.5	825	50.0	560-640	‡261	‡352
	790	24.0			872
15.0	700	26.0			1,030
14.0	754	70.0			610
11.6	800	65.0			565
12.0	720	40.0			700

*Possibly not operating at full capacity. †Upper trays. ‡Apparently foaming occurring at 825° F. outlet.

Cost of HCl Plants

What would be the approximate cost of a small (15 tons per day) hydrochloric acid plant producing caustic soda as a byproduct? Also what would be the electrical power demand and the amount of salt feed stock?—E. A. H.

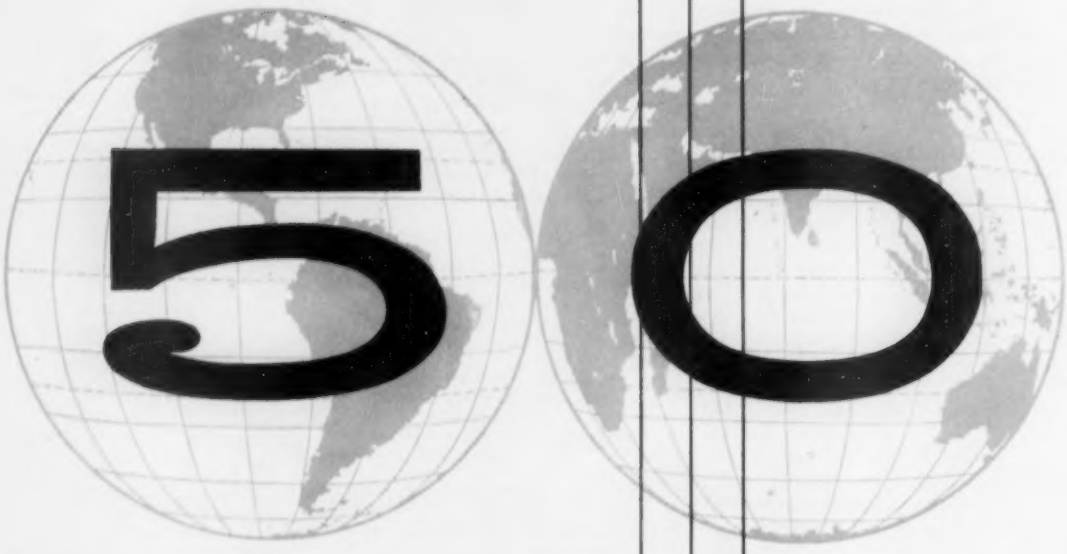
This question is really out of the realm of this department, both because acid manufacture is far removed from the petroleum industry and because we are not able to operate a consulting office. However, the cost of chlorine (and/or acid) and caustic plants appears to be:

Tons/day chlorine and caustic	Approx. new plant cost, 1956	Approx. cost of expansion, 1956
*33	$4,000,000	
50	5,000,000	
100	7,120,000 (and 9,403,000)	$2,190,000
106.4	6,040,000	
139	8,550,000	
274	12,700,000	
840		7,235,000

*About 15 tons hydrochloric acid per day. Obtained by extrapolation from the other costs.

All of these except the cost of the small plant are based on actual construction costs 1953-1956 taken from the Construction Reports of Chemical Engineering (Jan. 1953 and 1954), Inventory Issue of the same magazine (1954 and 1955), Kisten, Cameron & Carter, Chem. Eng., Nov. 1953, p. 191, and "What Price Process Plants," Chem. Eng., May 1951, p. 165. The danger in accepting such costs is doubt concerning exactly what type of plant or equipment is actually being built. Most of the above plants contemplate the production of only chlorine and caustic soda, but two of them appear to contemplate the production of acid. Inasmuch as acid manufacture by the burning of chlorine with hydrogen involves relatively simple equipment, the over-all plant cost is not greatly altered by the production of acid rather than ending with chlorine.

The amount of salt feed stock can be computed with ease and the power requirement for electrolysis can probably be found in chemical engineering text books. Only A. J. P. Wilson (Chem. Eng., July 1951, p. 284) mentions power and he shows a cost of $697 per day for a 50-ton per day (chlorine) plant.



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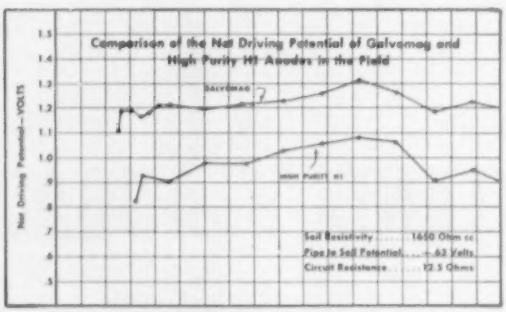
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Here, in step-by-step pictures, is a new way of assuring . . .

1. ANODE is spliced to feeder in usual manner, using either splitbolt or pressure connector. Lip of mold is trimmed to fit cable.

2. INSULATING MOLD is placed around joint. The two halves are held together by tongue-and-groove joint, snap into place.

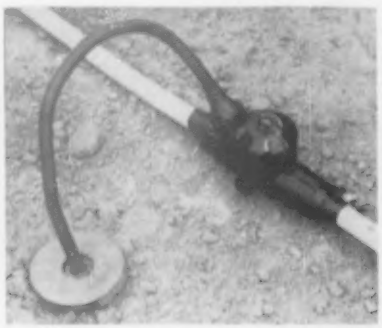
3. ENDS OF MOLD are taped to prevent leakage of liquid resin at the juncture between mold and wire.

Moistureproof splices for anode cables

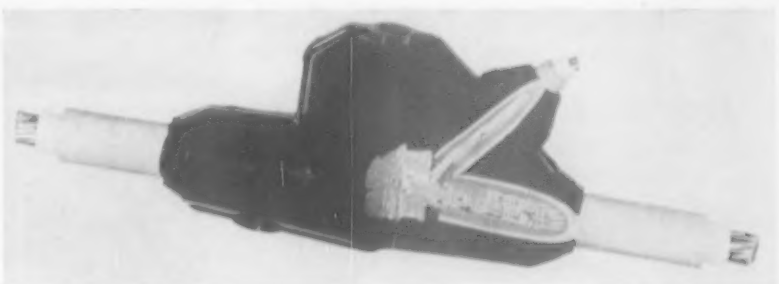
Corrosion engineers have long looked for a foolproof means of splicing anode leads to the positive feeder from cathodic-protection rectifier. This new splicing method, using epoxy resins, is the latest answer to the problem. The resin is poured into a mold around the joint. It gets watery thin during curing, penetrating to every part of the mold and bonding to both insulating material and conductor.

by A. C. Kilberg

4. POURING SPOUT is inserted, resin is mixed in package, and poured into mold. Self-generated heat causes mixture to set.



5. SPLICE takes about 10 minutes to make and is ready for almost immediate backfilling to complete the joint.



6. CUTAWAY of completed splice shows how insulating material fills every part of mold.

MOISTUREPROOF splices of uniform quality — a long-standing need in cathodic-protection systems for pipelines—have become a reality. A specially designed splicing kit has been developed using epoxy resin to case the completed splice in a solid block of insulating material.

The Y-splice, where a branch wire joins the main feeder, has always been a weak point in underground anode systems. If moisture enters here, or the splice fails for any other reason, the entire protection systems fails since the exposed wire can corrode through in a very short time.

Author is with pipe protection division, Minnesota Mining & Manufacuring Co., St. Paul, Minn.

Many of the problems of this method have been eliminated with the introduction of the "poured splice" method using epoxy resins. This is a new approach to the problem of splicing. Prior to the development of the poured splice kit, epoxy resins were long recognized as excellent insulating material. But they could be applied to electrical components only under controlled factory conditions where means for precise measuring, mixing, and heat control for curing were available.

Outstanding features of the epoxy resins which make them highly desirable for insulation use include their high dielectric strength and their resistance to moisture, acids, heat, and general deterioration. These resins have the additional advantage of bonding well with other insulating materials.

Because epoxy resins require mixing with a delicately measured catalyst or hardener in order to set the resin up, field use was a problem.

Resin mixed in field . . . The problem was solved by developing a plastic

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Pipeline Patrol

container with two compartments separated by a breakable plastic partition. One compartment holds the resin and the other the catalyst—both liquid materials. This patented package provides premeasured materials that can be mixed in the package and cured by heat generated by chemical action within the ingredients themselves. Development of this container led to the solution of the field splice problem.

Included in the kit, along with the container, is a two-piece, self-venting, plastic mold, a pouring spout, a roll of plastic tape, and an instruction sheet.

In field operations the splice is prepared in the same manner as for tape-and-coat insulation. The two-piece mold is then trimmed at the stepped ends to fit the cable size being used and the two halves are fitted around the feeder cable and branch. A tongue-and-groove system, built into the lips of the mold halves, holds the mold securely on the cable. The pouring spout is inserted in the hole provided at the top of the mold and splice is ready for pouring.

The divider strip in the container is ruptured by pulling on the sides of the envelope, allowing the resin and the catalyst to run together. Contents of the container are then vigorously mixed by squeezing the ends of the envelope 30 or 40 times.

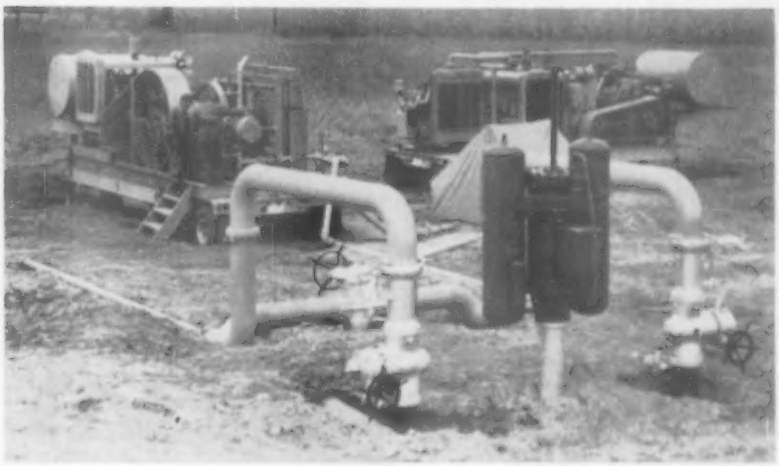
One corner of the cointainer is snipped off after the resin is mixed, and the contents poured into the mold. The mold is self-venting and no air outlets need be drilled.

Good penetration and bond . . . Inside the mold the resin builds up temperature through chemical action, changing from its original syrupy consistency to the approximate viscosity of kerosine before it "kicks over" and sets up permanently.

This thin viscosity just before setting enables the fluid resin to penetrate all parts of the splice, between the conducting strands and also into the ends of the factory insulation of the cable. In this thin stage the resin has excellent wetting power which establishes a firm bond with electrical conductors as well as most insulating materials.

The cast resin insulation offers uniformly high quality splices which are not dependent upon the varying skills of electrical workers making splices with the tape-and-coat method. Besides giving increased dependability, the splices can be made in much less time. The average splice can be completed in approximately 10 minutes.

The kits are made by Minnesota Mining & Manufacturing Co. under the name of "Scotchcast."



Compressors are dug in, hooked up in few hours for

Air-testing American La. 30-in.

A 400-MILE section of the American Louisiana Pipe Line is now being tested with compressed air and natural gas. This 30-in. line extends from Cameron, La., to Willow Run, Mich.

When completed the $130,000,000 project will represent one of the longest 30-in. lines in exeistence. It will serve customers in the Michigan, Iowa, Missouri, and Wisconsin areas.

Ten Caterpillar diesel engines driving Gardner-Denver compressors comprise the testing units. All will compress air except one which will test the southern end of the line with gas.

Each testing package is composed of one high-stage and two low-stage compressor units connected in series. The units are trailer-mounted, the high stage on one trailer, and the two low-stage units on another.

Each trailer has a 560-gal. fuel tank for its respective engine. The two engines for the low-stage compressors draw their fuel from the same tank. It will supply the low-stage engines for about 24 hours and the high-stage for about 48 hours.

The low-stage compressors are six-cylinder, two-stage, water-cooled units rated at 500 cu. ft. per minute. They are powered through a V-belt drive by an engine developing 165 hp. at 1,760 r.p.m.

The high-stage unit will deliver pressures from 150 to 950 psi. These units operate at 300 r.p.m. and are rated at 1,000 cu. ft. per minute. They are driven from a V-belt drive through an intermediate shaft and chain drive by a engine producing 175 hp. at 1,600 r.p.m.

Before any units began testing operations, headers were prepared, which included valves, for connecting to the pipeline. Usually a test section will run from 14 to 16 miles in length.

When the test arrives at the line section to be tested, the headers are connected and the trailer-mounted compressors are dug in to reduce vibration and rocking. Connecting the headers takes from 3 to 4 hours.

The low-stage compressors are hooked in series and pressure up the line to 150 psi. From this point on, the high-stage compressor takes over; the low-stage compressors are pumping into the high, and bring the line up to the test pressure of 944 psi. This pressure is held for 24 hours and recorded for permanent record on a recording chart. During this 24-hour period, if the pressure loss reaches 1 psi. per hour, it is a good indication the line has a leak which must be repaired.

Line pressure is brought up at a rate of approximately 3 psi. per hour. In some instances, more units are brought in to increase this rate. For the first test section, it takes about 2 weeks to bring the section up to the test pressure. Thereafter, testing time is reduced in half in adjoining sections. Air from the completed section is bled into the next section which equalizes the pressure in the two at 472 psi. if the sections are of equal length. The remaining air in the completed section is compressed into the next section.

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Among the
Drilling Contractors

Nickols & Duncan are contractors for Skelly Oil Co.'s new wildcat in Rio Arriba County, San Juan basin, New Mexico. The 2 Jicarilla "C" will be dug in SE NW NW 28-25n-5w. It is a Dakota test.

Rowan Drilling Co. has contract for a Shell Oil Co. 9,000-ft. Winnipeg wildcat in the Sunday area of Rosebud County, Montana. The well is the 24-21 Roberts, SE SW 21-11n-43e. Location is 13 miles southeast of Rock Springs.

Harper-Turner Drilling Co. will drill a wildcat for Texota Oil Co. and Harper Oil Co. in Cheyenne County, western Nebraska. It will be the 1 Jurgens, NW SW SE 6-15n-48w. Location is 1½ miles east of Gurley field.

Johnie Carter is drilling below conductor pipe for Wytex Service Co. and Rex Monahan in Kimball County, western Nebraska. The 1 Haug, C NW NW 9-12n-57w, is 1 mile north of Pat pool.

Exploration Drilling Co. is contractor for British-American Oil Producing Co.'s new Morrill County, western Nebraska wildcat, the 1-D Craig, C NW SW 23-19n-52w. Location is 9 miles south of Bayard.

Grady Roper is starting another well for Magnolia Petroleum Co. in the Cow Pen Creek area, 10 miles northeast of DeQuincy, in southern Beauregard Parish, southern Louisiana. The new operation, 1 Victoria Phillips, is a north offset to Magnolia's recently completed J. C. Phillips well. Contract is for 7,000 ft.

Brinkerhoff-Dunner Drilling Co. has contract for a 6,200-ft. Muddy sand test in the Garfield Peak area, C NW SE 24-33n-87w, Natrona County, Wyoming. The well will be drilled as the Brinkerhoff Drilling Co. 1 Government. Location is 20 miles southwest of Powder River.

Progressive Drilling Co. is drilling a Clareton, Wyo., field well for Otis A. Roberts and Diamond Oils, Inc. The well will be the 1-C Robinson-Government, C SE SE 23-43n-65w, Weston County.

Strain Drilling Co. has contract for a wildcat in 16n-52w, Cheyenne County, western Nebraska. The Denver-Julesburg basin test is the Bass-Vessels and Brown 1 Woten, C NE NW 18. Location is 1 mile northwest of Woten field.

Southern Six Drilling Co., Opelousas, La., has contracted with the newly formed Rimrock Petroleum Co. for an 8,000-ft. test to be drilled in the southeastern corner of St. Tammany Parish, southeasternmost of Louisiana's "Florida Parishes." Location is 10 miles southeast of Slidell in the marshes bordering Lake Borgne. It is 2 miles from

On location of a wildcat test R. G. Parrent, Casper contractor and operator, recently drilled for Roy G. Steele and others on government land near Sand Draw field, 30 miles southeast of Riverton, in Fremont County, Wyoming. Front row, left to right: G. W. Kirby, driller; and Gene Stephenson and Russ Williams, tool dressers. Back row, same order: Roy G. Steele, operator; and W. W. Stephenson and L. C. Stevens, interest-holders.

For medium to heavy pumping loads in non-corrosive fluids Jones Carbon Type 2 rod offers quality and service unexcelled in its field. A very high grade carbon manganese steel is made to Jones specification, fully normalized and shot peened to add strength and endurance. Precision machining and processing are a required Jones standard. Include Jones Type 2 rods on your next order.

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Bayonet-type latch on cover plate makes it easy and quick to remove or install rubber. Handles lock the cover on the body. Cover plate accommodates Guiberson Tubing Spider. Body may be tapped for two 2″ side outlets on special order. Pressure rating, 750 p.s.i. working pressure, 1500 p.s.i. test pressure. For 2″, 2½″ and 3″ tubing, and for flange sizes 6″-400, 6″-600, 6″-900, 8″-400 and 8″-600.

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Mississippi's Hancock County line (Pearl River), and about 7 miles west of Marshall Young's new Lower Cretaceous discovery well at Ansley.

Blackie Drilling Co., Houston, has taken on a 14,000-ft. test to be drilled for Olin Gas Transportation Corp., of Monroe, La., on the west flank of Lake Enfermer field, in southeastern Lafourche Parish, southeastern Louisiana. Permit is for 1 W. J. Harrison and others, in 9-20s-23e.

Penrod Drilling Co., Shreveport, has scheduled a 12,500-ft. test for Caroline Hunt Sands in the Crescent Farms area, northwest of Houma, in Terrebonne Parish, Louisiana Gulf Coast. Location is southwest of production at 1 Chauff Unit 1, in 13-17s-16e.

Bilbo - Redding Drilling Co., Houston, has contracted with Sohio Petroleum Co. for the drilling of a deep wildcat test 8 miles north of Jeanerette, in Iberia Parish, Coastal Louisiana. It will be on State Lease 2298, in 23-12s-9e. Permit calls for a 12,500-ft. test.

Southern Six Drilling Co., Opelousas, La., has a new wildcat operation 2½ miles south of the multi-pay Bourg field, in Terrebonne Parish. It is a contract job for Ralph E. Fair, Inc., at 1 Pellegrin, in 10-18s-18e.

K. L. Kellogg & Sons, Compton Calif., will drill a deep test for Union Oil Co. at a wildcat location northwest of La Habra, in northern Orange County, California. Location is between Sansinenna and Leffingwell field. Present plans call for an 11,000-ft. test, but operators may carry the hole to 15,000 ft., they say. The rig will be soundproofed.

Schafer Drilling Co., Oklahoma City, has taken a contract for a 5,600-ft. Mississippian test to be drilled for Imperial Oil Co. of Kansas in southwestern Scott County, western Kansas. Location at 1 Corn, in 27-20s-33w, is 6 miles southwest of Shallow Water townsite, and 2½ miles southwest of Shallow Water pool. It is about 6 miles off the north tip of the Hugoton gas area.

Gregg Oil Co., Gladewater, Tex., is handling contract for a 4,000-ft. Mooringsport test 2,325 ft. northwest of McKinney Bayou field, Miller County, Arkansas. The well is Spaling Petroleum Co., G. B. Christmas, Texarkana, and Associates 1 Milam, C NE NE SE 15-16s-26w. The wildcat is on part of a sizeable block held by Christmas and associates.

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by Dan B. Miller

Wrap-Around Wrench Will Not Mar Pipe or Tubing

A wrap-around wrench with insert sets is designed for aluminum, brass, stainless steel, and other pipe and tubing. The wrench has a ratchet action and will not mar the pipe or tubing surface. It is especially effective in close-quarter work.

The wrench without inserts fits 2½-in. pipe and with insert sets fits all pipe sizes from ¾ to 2½ in. Insert sets are available for tubing sizes from 1 in. increasing by 1/32-in. increments for each size to 2⅞ in. **For more information write or call: Dale Co., 1237 West Fifteenth Street, Long Beach 13, Calif.**

●

Lightweight Fire Hose Designed for Oil Industry

A new lightweight, rubber-covered fire hose has been developed for use in refineries, oil fields, and oil-loading docks. The hose is about 50 per cent lighter in weight than conventional rubber-covered fire hose.

The hose jackets are woven with Dacron filler yarns to obtain great strength without excessive weight or bulk. Filler yarns go around the hose and carry the pressure load. The hose is tested to 400 psi. An oilproof, chemical and weather-resistant rubber cover shields the hose jacket from abrasion and protects the hose against petroleum and chemical products. **For more information write or call: B. F. Goodrich Co., Industrial Products Division, Akron, Ohio.**

New Computer Has Broad Application

A new electronic computer combines in one unit a general-purpose digital computer with a digital-differential analyzer for application to problems of research and control.

This combination provides the wide applicability of a general-purpose computer along with the simple programming characteristics of differential analyzers for the solution of linear and nonlinear differential equations.

Flexibility provides for a wide range of efficient program solutions and simplified interpretive subroutines by persons without previous computer experience.

All operations of the computer are controlled from the master writer, an electric typewriter mounted on a base containing control elements. The keyboard may be used to enter information directly into the computer. Output of the machine also may be tabulated by the master writer.

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reader and paper-tape punch are standard equipment. Up to four magnetic tape units, each with 300,000-word storage, can be provided as well as graph plotter and follower or other desired equipment. **For more information write or call: Bendix Computer Division, Bendix Aviation Corp., 5630 Arbor Vitae Street, Los Angeles 45, Calif.**

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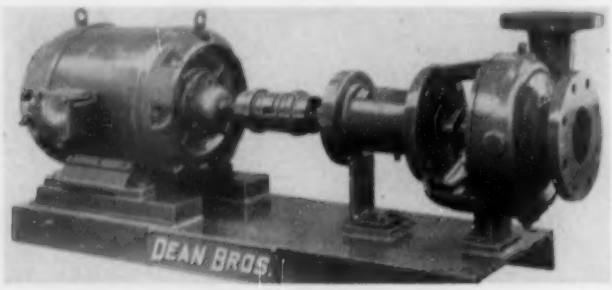

Pumps Standardized for Economy

Only three parts, impeller, casing, and back-head cradle, vary with the size and capacity of a new line of seven standard centrifugal pumps. All other parts in the line are the same.

The new Type GS series comprises seven sizes ranging from 1 by 2 in. to 3 by 4 in. Pumping capacity extends to 600 g.p.m. and total dynamic head to 275 ft. Pumping temperatures cover a range from — 40° F. to 350° F.

Type GS pumps are an inexpensive line of standardized pumps for a wide range of applications where conditions do not necessarily require a more costly engineered pump. **For more information write or call: Dean Brothers Pumps, Inc., Indianapolis, Ind.**

●

12.5 Hp. Air-Cooled Engine Weighs 175 Lb.

A new short-stroke, gasoline engine is designed for heavy-duty applications. The K330 is a single-cylinder, four-cycle, air-cooled engine equipped with flyweight governor, oil-bath air cleaner, silencer-type muffler, fuel pump and oil-pressure gage. It will also be made available in a number of optional models that will include direct mounting crankcase, reduction gear, hand clutch, and electric starter and generator. It weighs 175 lb.

Breaker points, mounted externally, are readily accessible for quick service operations, and the assembly is dustproof and moistureproof. A stop button is conveniently mounted on the breaker-point cover.

The K330 produces 8.2 hp. at 1,800 r.p.m., 10.2 hp. at 2,400 r.p.m., 12.3 hp. at 3,000 r.p.m., and the peak output of 12.5 hp. at 3,200 r.p.m. Foot pounds of torque range from 23.8 at 1,800 r.p.m. to 20.3 at 3,200 r.p.m. The bore is 3⅝ in., stroke 3¼ in., and the piston displacement is 33.6 cu. in. **For more information write or call: Kohler Co., Kohler, Wis.**

●

Valve Mandrels Permit Two Strings of Tubing

New oval-shaped Type KBM and KCM retrievable valve mandrels are used for gas-lift application. They permit the separate running of two parallel strings of 2-in. tubing in 7-in. casing. This parallel-string installation with all valves for both zones selectively retrievable, provides a full-open tubing bore through which any normal wireline operation, including swabbing and perforating, can be performed.

The new KBM mandrel provides a full-open 1 15/16-in. bore with valves in place. It accommodates Camco's pressure-operated valves, orifice valves, circulating valves, differential valves, chemical-injector valves, and dummies for blanking off, with all valves selectively retrievable.

The new Type KCM mandrel has the same maximum and minimum outside diameters of 4 13/64-in. and 2 29/32-in. as does the Type KBM. It is used for deeper lifting in excess of 7,000 ft. with large bellows valves seated in the mandrel. It provides a full-open bore with the smaller bellows valves in place and has a slightly restricted 1⅝-in. bore with a large bellows valve in the mandrel pocket.

These mandrels will withstand in excess of 6,000 psi. internal burst pressure and in excess of 5,000 psi. external collapse pressure. They have a tensile strength in excess of the 104,000-lb. tensile strength of 2-in. N-80 tubing. **For more information write or call: Camco, Inc., P. O. Box 14484, Houston 21, Tex.**

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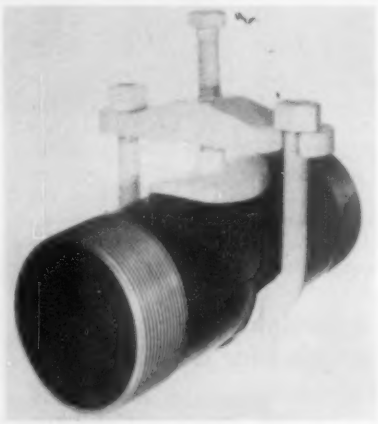

Clamp Tool Repairs Pipe Without Shutting Off Line

A new clamp tool repairs pipe leaks quickly, permanently, and economically. The tool consists of the Atlas pipe clamp and Atlas patches which are shaped to fit specific pipe sizes and assures a tight fit when the gasket is compressed. The pipe tool is made in two styles: the saddle type in four sizes for use on pipe 6 in. in diameter and less; and the chain type in all sizes from 6 in. up to any size. The patches are made of steel with either Neoprene or asbestos gaskets.

The clamp is placed around the leak-

22,570 FEET - 350°F - Magcobar was there!

A major factor in drilling the world's deepest well was good mud control and good mud. Magcobar furnished approximately 80% of the drilling mud and chemicals on the LL&E No. 1-L Humble, record breaker drilled by Richardson & Bass, John W. Mecom, and Freeport Sulphur.

Here's what the trade papers have to say about the mud program on the world's deepest well:

Oil & Gas Journal, January 23, 1956:

"Good mud control was an important factor in the well's reaching the record depth . . . Static bottom hole temperature was estimated to be more than 350° F . . . Lime treated muds usually cause trouble by solidifying at this temperature, but this mud stayed in good condition all the way . . ."

Petroleum Week, November 18, 1955:

"The planning that went into this well is also evidenced by the careful handling of the mud . . ."

Petroleum Engineer, December, 1955:

"Operators point out that the success achieved can be largely attributed to careful planning and excellent control of the drilling mud . . . Mud control is key to record depth . . . Of considerable interest is the lack of difficulties due to lost circulation, excessive gas cutting and excessive filter cake commonly encountered in South Louisiana. Success in avoiding these difficulties has been attributed to the accurate control of the mud weight and properties."

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H.B. ZACHRY CO.
PIPE LINE DEPARTMENT
TRANSIT TOWER, SAN ANTONIO, TEXAS

ing pipe, without shutting off the line, reducing pressure, or causing any loss of time or flow. The patch is applied directly over the leak, and then sufficient pressure is applied by the clamp to stop the leak. The patch can then be welded to the pipe or the clamp can be left on until it is convenient to weld the patch. These tools have been tested under pressures to 6,000 psi.

Where welding is hazardous or prohibitive, a cold-weld process safely and permanently welds the patch to the pipe. A cement is applied to both pipe and patch. The clamp is applied and left in place 24 to 48 hours. Patches applied by this method have been tested under pressures exceeding 2,000 psi. **For more information write or call: Atlas Industries, Inc., P. O. Box 8152, Houston, Tex.**

●

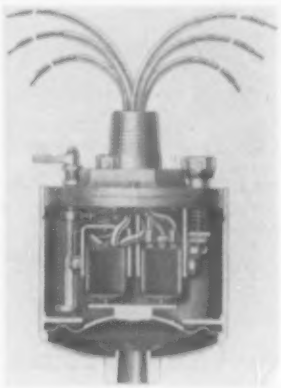
Safety Shut-Off Valve Protects Against Fire

This safety shut-off valve protects against fire and collision losses. It is designed for use on multiple-pedestal installations of the pusher type where the product is pumped from storage to remote dispensing units and for use where elevated storage tanks keep the dispensing pedestal under positive pressure.

In the event of fire, a fusible link which melts out at 160° allows a liquid-cooled internal spring and weighted lever to automatically and safely snap the valve shut, keeping more of the product from escaping. In the event the pedestal is overturned, a highly sensitive machined shear section breaks and allows the valve to close, keeping the product from flowing into the area and causing further loss and hazard. If the pedestal is bumped, a sensitive spring-loaded latch is released, allowing the valve to close tightly.

The valve has a cadmium-plated cast-iron body and weighted lever. The internal mechanism is of noncorrosive aluminum or hard wear-resistant bronze. This valve is furnished with a 1½-in.-outlet end designed to connect to a Dresser fitting. It is also furnished with a female-thread end, a union end, or a Victaulic end. **For more information write or call: OPW Corp., 2735 Colerain Avenue, Cincinnati 25, Ohio.**

●



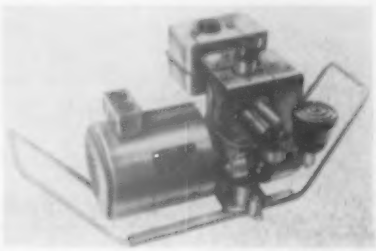
Two-Way Switch Protects Against High, Low Pressure

Two pressure switches in one signal when pressure rises or falls to the danger zone. It will shut down the system if pressure continues to rise or fall to a predetermined safety limit. The manual reset is so arranged that the system cannot be reactivated until the pressure has been returned to a safe level.

Each switching element in the unit can be electrically independent of the other (one a.c., the other d.c., if necessary), or two external leads can be supplied to control a single circuit between maximum and minimum pressures.

This Meletron pressure switch designated as Model 432, comes in three classes of proof pressures: 6, 30, and 120 psi., with an adjustable range from 0.05 to 100 psi. **For more information write or call: Barksdale Valves, Pressure Switch Division, 5125 Alcoa Avenue, Los Angeles 58, Calif.**

●



New Electric Plant Driven By Air-Cooled Engine

A new, lightweight, 88-lb., engine-driven electric plant is rated at 1,000 watts continuous duty. The basic unit

OIL AND GAS JOURNAL Showcase Coupon

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Described in the April 9, 1956, issue of The Oil and Gas Journal

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COMPANY _____

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DATE _____

is a manual-starting, two-wire, 60-cycle, a.c. single-phase set. Its Briggs & Stratton engine is equipped with air filter, fuel system and tank, ignition system, lubrication system, governor, and muffler.

The engine is directly connected to a N.E.M.A.-standard, horizontal, ball-bearing, drip-proof, self-excited, self-regulated, rotating-armature type a.c. generator. The entire unit is permanently aligned and mounted on a steel-base-and-carrying-handle combination. Two receptacles are incorporated for electrical load connections. The plant design incorporates a 15-per-cent overload capacity for emergency service. **For more information write or call: International Fermont Machinery Co., Inc., Ramapo, N. Y.**

●

Steam-Cleaning Gun Has Built-In Cooling System

The Hurriclean gun is designed for steam-cleaning efficiency, cool handling, and easy operation. This solution-lifting steam gun uses the cleaning solution to protect the operator

from the heat of the steam. The Hurriclean gun uses a tube within a tube, with steam passing through the insulated inside tube and the cleaning solution through the outside tube, reducing external temperature of the gun. A sealed rotary joint permits rotation of the nozzle without twisting the solution or the steam hose.

The Hurriclean gun is made with a cast-aluminum spade-type rear handle, cast-brass valves, stainless-steel outer and inner tubes and nozzle, and an oil-resistant forward rubber grip. The gun weighs 6¾ lb. in its 3½-ft. length, and slightly more in the 5-ft. size. **For more information write or call: Oakite Products, Inc., 19 Rector Street, New York 6, N. Y.**

●

Pump Handles Abrasive And Corrosive Materials

A new hydraulic pressure-exchange pump is for pumping abrasive and corrosive muds, slurries, and solutions. The design eliminates plungers and packing and separates the product being pumped from contact with moving parts. Stuffing boxes, plunger packing, and other components, commonly used in reciprocating, rotary, or centrifugal pumps, have been eliminated for lower maintenance cost and less down time.

This hydraulic pressure-exchange pump handles material at high temperatures. It operates at pressures up to 2,000 psi. and capacities up to 120 g.p.m. The slow cycling of the pump increases check-valve life. **For more information write or call: Manton-Gaulin Manufacturing Co., Inc., 44 Garden Street, Everett 49, Mass.**

●

Jeep Industrial Engines Convertible to L.P.G.

L.P.G. and natural-gas conversions of Jeep L-head and F-head industrial engines are now available as optional equipment. The use of hard-faced stellite valve inserts, standard Willys water cooling of the manifold, and an L.P.G. carburetor and regulator equipment make the Jeep engine ideal for burning propane or natural gas.

Advantages of utilizing L.P.G. for

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Copper	37.00%	Minimum
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Fe	.04%	Maximum
Zn	.01%	Maximum
Water Soluble	more than 99.50%	
Insoluble as copper oxychloride	less than .50%	

CHECK THESE FEATURES:
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√ LOWER MOISTURE
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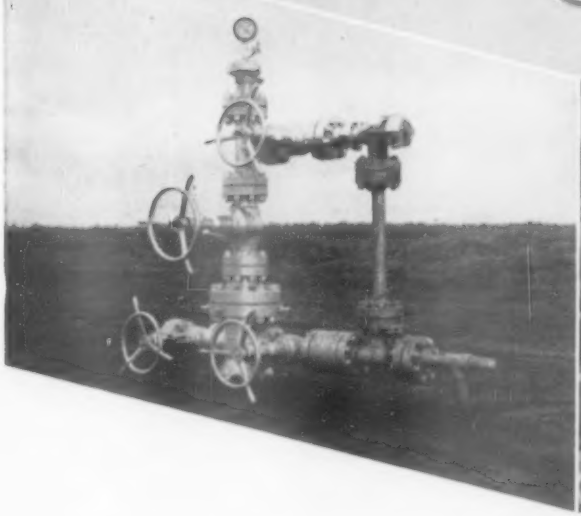
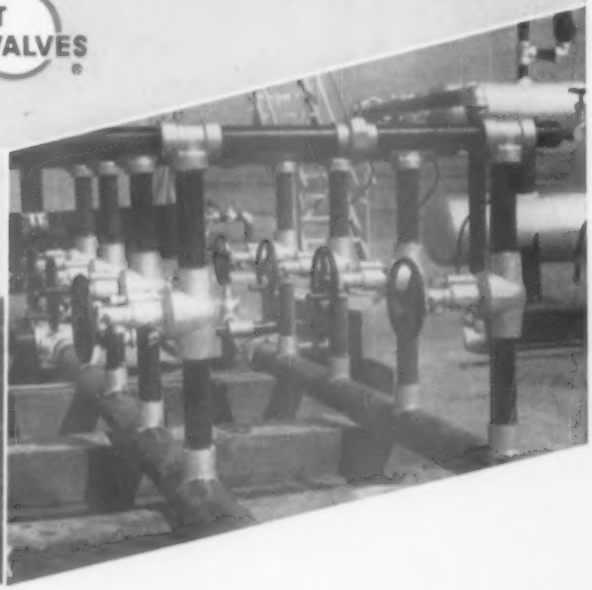
ORBIT VALVES





POSITIVE SEATING
Orbit Production Valves

Positive closure in Orbit Valves is insured because there is no distortion of metal to obtain closure; Orbit's yielding body seat always resists further compression of the seating segment by pushing back against it.

Friction between the body seat and the face of the core has been eliminated because of the free movement of these parts. Contact of the major seating surfaces is obtained by the "rolling" action of the seating core into the body seat.

Orbit's streamlined design permits reduced weight and allows installation in minimum space. For longer periods of uninterrupted service use ORBIT valves —they give longer continuous heavy duty service.

A full range of sizes are available beginning with 1", to and including 4". Test pressures 1,000 to 10,000 lbs. API Class. Screw and Flange end.

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This is the barge

that drilled the

world's deepest well!

Like so much other oil-marine equipment that has played an important part in establishing "notable firsts" in tidelands operations, the Keystone-Slaughter drilling barge which figured in the drilling of the Humble LL & E No. 1-L by Richardson and Bass, John W. Mecom, and Freeport Sulphur Co., was built by

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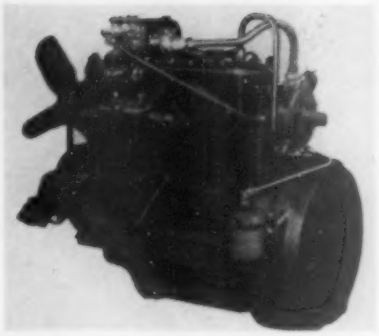
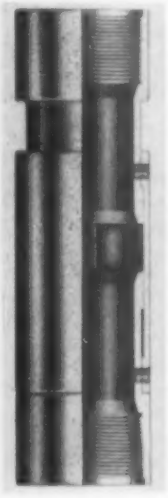


industrial engine power are the prolonged use of lubricating oil without danger of thinning the substantial reduction of carbon deposits; the less frequent need for maintenance, and the longer life of the engines because lubrication of moving parts from the crankcase reaches a high degree of efficiency. **For more information write or call: Willys Motors, Inc., Industrial Engine Department, Toledo, Ohio.**

•

Coupling Prevents Damage To Liners and Screens



An adjuster coupling replaces the standard coupling on liner strings and prevents compaction or tension damage to liners and screens. The adjuster coupling has a 2-in. stroke up or down from center. Two sets of shear pins make it possible to provide one shear point in tension and a different shear point in compression. Case is equipped with splines so the liner-adjuster coupling is handled in the same manner as a standard solid coupling. A full range of pipe sizes is available, with shear pins to specifications. **For more information write or call: Creighton Oil Tool Co., P. O. Box 7143, Long Beach 7, Calif.**

•

Polyethylene Tape Is Used On Ells, Valves, Fittings

An improved polyethylene tape coating is for corrosion control on fittings and irregular-shaped contours.

Polyken No. 940 has been designed for use on ells, valves, fittings, T-joints,

and general use on in-plant pipe. A proper balance of dead stretch for contour conformability and elasticity for wrap-tight fit to irregular shapes and surfaces makes it particularly suitable to these applications. **For more information write or call: The Kendall Co., Polyken Sales Division, 222 West Adams Street, Chicago 6, Ill.**

●

Instrument Shows Odorant In L.P.G. and Natural Gas

A new battery-operated instrument is used for the determination of odorant in natural and liquid propane gases. The portable Odortester needs no conversion or calibration curves because the meter registers directly in terms of per cent of gas by volume. It uses Wheatstone Bridge filaments. **For more information write or call: Davis Instruments, Inc., 45 Halleck Street, Newark, N. J.**

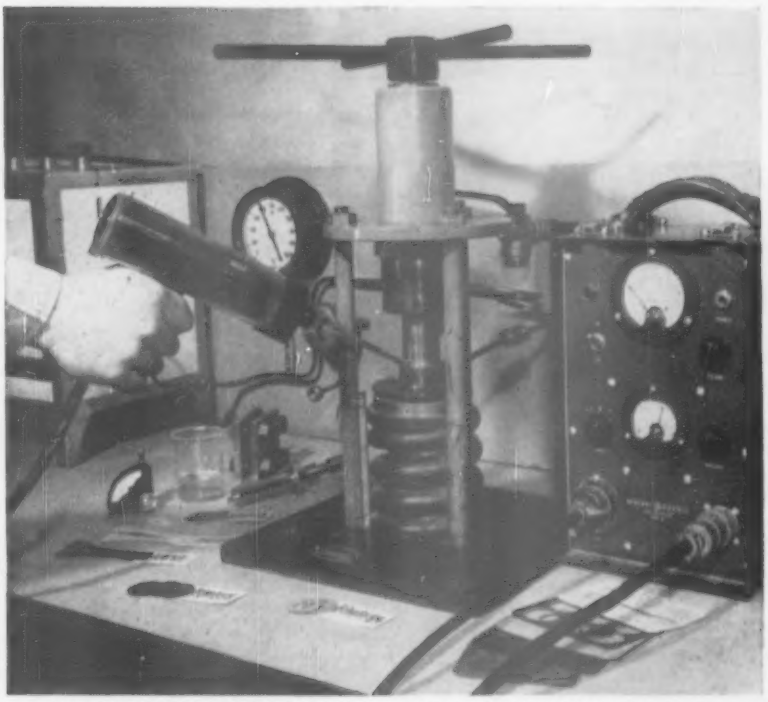
●

Transistorized Equipment Improves Voice Quality

A new transistorized dynamic microphone for mobile-radio applications provides improved mobile-transmission quality, comparable to that of a base station.

The microphone features a dynamic element employed in conjunction with a built-in transistor preamplifier. Voice intelligibility from the mobile unit is said to be readily demonstrable.

The new development is also available as a dual-purpose, dynamic speaker-mike which functions both as a full-output communications-type loudspeaker as well as a dynamic microphone. It can be mounted or held near the operator's ear. **For more information write or call: Motorola Communications & Electronics, Inc., 4501 West Augusta Boulevard, Chicago 51, Ill.**



This detector is so sensitive it can pick up a leak as small as 1/100 ounce a year.

R/M SHEET PACKINGS ARE RIGIDLY TESTED FOR QUALITY BEFORE SHIPMENT

The leak detection test pictured above is just one of many run on R/M Sheet Packings to make certain they meet the high standards for which R/M is known. They are tested also for tensile strength, elongation, compression and recovery, compression set, flexibility, hardness and density. Additional tests for swell and volume change are run at elevated and room temperatures after immersion in oils.

R/M's line of sheet packings for the petroleum industry is complete and includes such outstanding examples as the following:

R/M No. K-68. Has exceptional non-cold-flow characteristics. Immersed in oil, its positive measured swell is less than 15%, and its tensile strength remains between 90 and 100% of original value. It is particularly recommended for equipment handling light petroleum fractions at high temperatures.

R/M No. B-40. Has controlled swell in oil without disintegration. Is excellent for stopping leaks caused by cover warping; for diesel engines where vibration is a factor; and where copper corrosion would be detrimental.

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex, Vee-Square, Universal Plastic, and "Versi-pak"®; GASKETS, "TEFLON"* PRODUCTS. SEE YOUR R/M DISTRIBUTOR.

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PACKING DIVISION, PASSAIC, N.J.
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OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Remote-Controlled Allison Pumping Unit for fracturing work is the subject of a three-color, 12-page booklet, describing the truck-mounted unit with its Allison 12-cylinder, 1,100-hp. engine recently added to the Dowell fleet. The unit is remotely controlled by an intsrument control board. This puts the operator in a safe place and away from noise. The unit uses a hydraulic torque converter to transmit the power to the pump. The pump operates at up to 11,000 lb. pressure. **For more information write or call: Dowell Incorporated, Box 536, Tulsa, Okla.**

●

Oil-Field Rubber Products Catalog. The new 1956, 60-page, two-color edition of the PB catalog, No. 56, illustrates and describes the complete PB product line. Product classifications include casing protectors; stabilizers; kelly sub rubbers; pipe wipers; wire-line guides; dead-line stabilizers; mud guns; mud-tank connectors; swivel, link, crown, and traveling-block bumpers; wire-line, sucker-rod, and tubing wipers; and sucker-rod and tubing couplings with molded-on protectors. A feature of the catalog is bar-graph clearance charts for easy selection of correct casing-protector and stabilizer sizes. **For more information write or call: Byron Jackson, Division of Borg-Warner Corp., P. O. Box 2017A, Terminal Annex, Los Angeles 54, Calif.**

●

Motor-Control Center. A compactly designed general-purpose motor-control center which permits savings of up to 50 per cent in floor area is described in a new 24-page, two-color bulletin, GEA-6367. The new publication describes in detail the construction and application. It also lists ratings, weights, dimensions, installation data, and guide form specifications. The control center, known as the Type DA-7093, is designed to accommodate starter units of either the fusible or circuit-breaker type in NEMA sizes 1 through 5. It is available in ratings of 1 to 200 hp., 110 to 600 volts, three-phase with short-circuit capacities of 15,000, 25,000, and 50,000 amp. RMS asymmetrical. **For more information write or call: Distribution Assemblies Department, General Electric Co., Plainville, Conn.**

●

Expansion Joint Design Guide. Catalog 153 is filled with engineering application and selection data that is necessary to the proper solution of pipeline expansion problems. Features of the 24-page expansion-joint-design guide include a discussion of the various types of expansion joints on the market, the many types of Flexon expansion joints available, and types of pipeline motion solved by expansion joints. The center spread of the catalog is devoted to a schematic-piping layout il-

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NEW ISSUES March 27, 1956

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(Each share convertible into 2 shares of Common Stock)

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The Company is engaged in the exploration, development and operation of oil and natural gas properties and in the production and sale of oil and natural gas.

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HOLMAR is the Water Tube Boiler that does a BIG job at little cost.
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lustrating various expansion-joint applications and principles. **For more information write or call: Flexonics Corp., 1346 South Third Avenue, Maywood, Ill.**

●

Petroleum-Handling Studies. Material-handling savings by both Union Oil Co.'s Los Angeles terminal-refinery and Cities Service Co., Linden, N. J., are described in three field reports. The reports, prepared in case-history style, show how these customers utilize lift trucks with the Hyster load-grab attachment for palletless handling of as many as four drums at once. **For more information write or call: Hyster Co., 2902 Northeast Clackamas Street, Portland 8, Ore.**

●

Materials for Industry is a 12-page publication describing Fiberglas and Kaylo products for maintenance and supply. Illustrated by 15 photographs and 16 sketches are: Kaylo high-temperature block and pipe insulations, Fiberglas industrial insulations, Fiberglas reinforced tapes and waterproof papers, Fiberglas insulated electrical apparatus, filter, builtup roofing and Fiberglas reinforced plastic panels for sky and sidelights. **For more information write or call: Owens-Corning Fiberglas Corp., Toledo 1, Ohio.**

●

Rust-Oleum General Catalog. Twenty-eight pages in length, this new 1955 catalog, Form 255, presents an important treatise in rust prevention with illustrations of Rust-Oleum uses and applications throughout industry. Included are 102 color chips showing the many colors available in primers, short oil-type coatings, oil-field finishes, machinery and implement colors, long oil-type coatings, Galvinoleum coatings, heat-resistant coatings, and chemical-resistant coatings. **For more information write or call: Rust-Oleum Corp., 2799 Oakton Street, Evanston, Ill.**

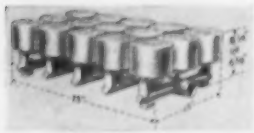
●

Fundamentals of Controlled-Volume Pumping. Technical paper No. 65 details metering-pump accuracy tests. The text and illustrations of a recent talk given before the Instrument Society of America on factors governing accuracy in controlled-volume pumping are presented in the bound technical paper. Test procedures and results of separate investigations of metering accuracy are recorded in the paper. The paper describes how controlled-volume pumps, because of their high volumetric efficiency and accuracy are used as flow-control instruments in both open and closed-loop instrumentation systems. **For more information write or call: Milton Roy Co., Station M, 1300 East Mermaid Lane, Philadelphia 18, Pa.**

●

Four Ways Refiners May Produce 100 Octane Clear. Four practical methods of achieving 100-octane clear gasoline are described and diagrammed in the current issue of the Houdry Pioneer. The four methods are (1) single-stage Houdriforming with periodic catalyst regeneration, and Iso-Plus processing schemes supplementing continuous, mild, nonregenerative Houdriforming with (2) separate Houdriforming of paraffinic raffinate, (3) recycling of paraffinic raffinate, or (4) thermal reforming. The principal article, "Achieving 100 Octane Clear Using Houdry Reforming Processes," dicusses the chemistry and technology of the four process schemes, and presents flow diagrams as well as tabular data. **For more information write or call: Houdry Process Corp., 1528 Walnut Street, Philadelphia 2, Pa.**

"Blue Flame"



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Low Pressure Gas Burner

Mixes the primary air and fuel with a double reversing principle to secure the best possible mixture to afford a hot blue flame, resulting in maximum horsepower at minimum cost. INFERNO Low Pressure Gas Burners are strongly constructed to withstand roughest oil field usage. Write for new Bulletin No. 30.

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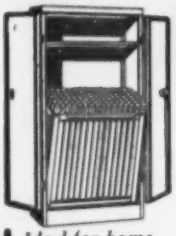

MAP FILE
MT4
Metal cabinet map file with locking doors. 112 tilting tubes. Easy to file and find maps, tracings to 60".
Ideal for home and field offices.
PATENT NO. 1610368 Other Patents Pending
SCOTT-RICE COMPANY
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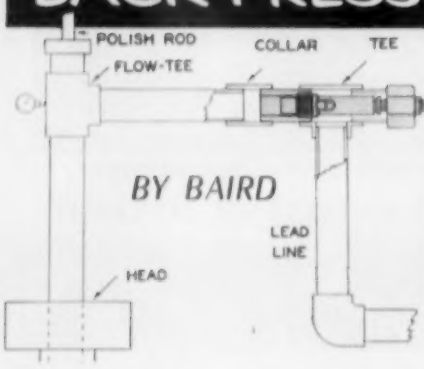
BACK-PRESSURE REGULATOR

"Wherever there's oil you'll find Baird products on the job."



Keeps pressure on tubing strings.

For wells that head up and flow, back pressure on the tubing tends to keep the tubing full which prevents stuffing box trouble and increases pump efficiency. By maintaining a back pressure on the tubing, this regulator keeps gas from breaking out of the solution and thus helps to prevent paraffin formation.

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EQUIPMENT MEN . . . in the News

Saulsbury Heads Hughes Tool North Texas District

O. D. SAULSBURY

Formation of a new district in Hughes Tool Co.'s North Texas division, with headquarters in Wichita Falls, is announced by E. M. Connor, western regional sales manager. Olen D. Saulsbury has been appointed manager of the new district. Saulsbury has been with the Hughes organization since 1943, serving in various capacities in Texas, Oklahoma, and New Mexico.

Long Heads New Vapor Recovery Factory Branch

Ray Long has been promoted by The Vapor Recovery Systems Co. from the sales department at the factory to district manager of the Gulf Coast states area with headquarters in Houston. The company is establishing a factory branch office to serve this territory. George W. Noyes will assist Long in sales engineering and service.

Long in the past 4 years has worked in production, production control, advertising, and sales departments of the company. Noyes has served on the engineering staffs of Humble Pipe Line Co., Fluor Corp., and Brown & Root.

Hob Huey Is Named Vice President by United Supply

Hob Huey has been appointed vice president of United Supply Co., Brooks Gutelius, Jr., company president, has announced. Huey was recently transferred to the Tulsa home office from the Dallas-Fort Worth territory when Roger Northup was transferred from Midland, Tex., and made vice president in charge of Texas-New Mexico operations with headquarters in Dallas.

Huey joined United Supply 17 years ago. He has accumulated extensive field experience through close contact with oil-industry operations in Kansas, Oklahoma, and Texas and has also held administrative positions in United's Tulsa headquarters.

Stewart & Stevenson Holds Annual Sales Meeting

The sixteenth annual general sales meeting of Stewart & Stevenson Services, held recently in Houston, was attended by representatives of General Motors, Chrysler, Climax, and Wade'Rain along with Stewart & Stevenson dealers and representatives throughout Texas.

Ross Stewart, president of Stewart & Stevenson, and Joe Manning, vice president and general manager, presided at the meeting. Other speakers included these representatives from the Detroit Diesel Engine Division of General Motors: R. E. Hunter, general sales manager; R. V. Baxley, operations manager; T. L. Guarniere, merchandising manager; A. F. Campbell, manager petroleum industrial sales; C. J. Davy, district sales representative; Gene Colleoni, district service representative; and A. M. Hazell, district sales representative, Electromotive Division of General Motors. Also, Robert M. Morgan, national sales manager, R. M. Wade Co.; Lowell Firstenberger, president, and E. A. Everett, national sales manager, of Feese & Firstenberger. Representatives from the Industrial and Marine Engine Division of Chrysler Corp. included: D. D. Chene, district manager; and Harry Williams, Chrysler representative. From Climax Engine & Pump Manufacturing Co. were: Ted Skeen, director of sales; Joe Downs and Richard Whelock, sales representatives.

Manning, Maxwell & Moore Changes Sales Personnel

Recent personnel changes have been announced by the Industrial Controls Division of Manning, Maxwell & Moore of Stratford, Conn.

Robert O. Wilson has been transferred to the Philadelphia office as sales engineer for process controls. John E. R. Johnson has joined the staff of the Chicago office as sales engineer.

Maurice F. Hyett has joined the Houston office as sales engineer for the southwestern district. Jack L. Gates has been transferred to the Tulsa office as sales and application engineer.

National Tank Promotes Notely to Seminole Manager

JOE NOTELY

Joe Notely has been promoted to manager of the Seminole, Okla., branch of National Tank Co., according to an announcement by Jay P. Walker, president. Notely succeeds Joe Marshall, long-time National employe, who retired recently.

Notely was transferred from the Oklahoma City branch to Seminole in 1944 as an office man and since 1948 has been in sales and service.

Alco Acquires Land for Warehouse-Office Expansion

Alco Products, Inc., announced an expansion plan for its Beaumont plant, the former Beaumont Iron Works Co. With the aid of the Beaumont Chamber of Commerce, the company is completing transactions to purchase more than two acres of land adjacent to its present property. Plans call for construction of a combination warehouse-office building on the newly acquired land, plus expansion of Alco's present manufacturing facilities.

To be completed in June 1956, the new warehouse will be used for storage of diesel-electric drilling-rig power packages, as well as the company's pipeline-pumping and auxiliary-power diesel engines. In addition, oil-field drilling and production equipment and flanges, other rolled-steel products, and

NOW . . . you can fill casing from bottom more efficiently than ever!

RECTOR Type "O" Fill Shoe and Fill Collar

Used in conjunction with each other, Rector Type "O" Fill Shoe and Fill Collar provide an automatic constant fill; increase operating flexibility while running casing and during cementing operations. They reduce running time, increase safety, efficiency and economy and minimize the danger of sticking pipe.

RUNNING TIME REDUCED because manual fill is eliminated.

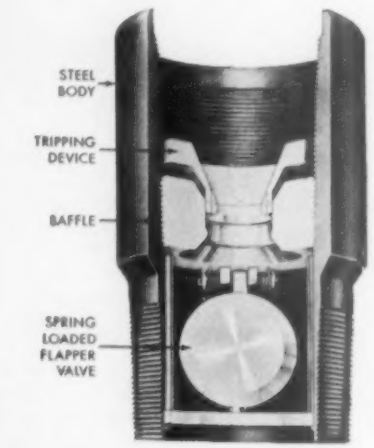
PIPE STICKING MINIMIZED because no "stops" are required to fill from top.

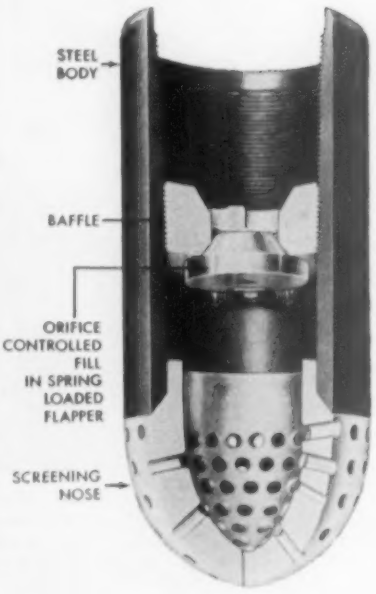
REDUCES PRESSURE SURGE and danger of breaking-down formations, causing lost circulation and loss of drilling fluids.

UNRESTRICTED PASSAGE OF FLUID permits greater volumes through shoe and collar at reduced pump pressures with higher velocity in annulus.

ORIFICE FILL AFTER CIRCULATION. You can stop and circulate as often and long as desired with continued orifice fill when running is resumed.

CONVERTS TO FLOAT WHEN DESIRED, by tripping flapper valve in collar which provides positive closure.





• Internal parts of both shoe and collar are a special aluminum alloy which has greater strength and abrasion resistance, plus easier and faster drill out.

The Type "O" Fill Shoe has a perforated aluminum alloy nose and baffle which is equipped with spring-loaded flapper valve with orifice choke. Orifice inserts are available in various choke diameters engineered for all pipe sizes.

The Type "O" Fill Collar has an aluminum alloy baffle, spring-loaded flapper valve and shear pin assembly for holding valve open. It functions as a back pressure valve or float collar. The flapper valve can be closed at any time by dropping a trip ball in casing at surface. At 650 p.s.i. pump pressure the ball releases flapper valve to provide a positive closure. Ball gravitates, or is pumped into nose of shoe.

If casing is run to total depth with orifice fill, ball is not used. Seating of cement plug on fill collar releases and closes flapper valve which then acts as back pressure valve, providing positive flow-back control.

OUR 25th YEAR

RECTOR WELL EQUIPMENT COMPANY INC

MAKING THE OIL INDUSTRY SAFER

5100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2515 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

heat exchangers will be stocked in the building.

Expansion of the present Beaumont plant will include increased facilities for production of heavy-duty heat-transfer equipment, as well as oil-drilling and production equipment.

Rector Appoints Herndon As Casper Representative

Alfred Herndon has been appointed representative for Rector Well Equipment Co., Inc., at Casper, Wyo., according to J. L. Pinkard, sales manager. Previously, Herndon worked for Waukesha Engine & Equipment Co. Between 1942 and 1950 he was with Visco Chemical Co., first in Houston and then as their Rocky Mountain representative.

McCullough Tool Appoints Roy Collum and L. M. Oaks

Appointment of Roy N. Collum as branch manager of the service location at Magnolia, Ark., and the appointment of L. M. Oaks as manager of the Regina district branches in Saskatchewan and Manitoba, Canada, have been announced by McCullough Tool Co.'s vice president, O. J. McCullough.

R. N. COLLUM

L. M. OAKS

Collum will supervise operations at McCullough's Arkansas branch, servicing South and Central Arkansas and parts of northern Louisiana. Norman Brookes, Canadian division manager, stated that Oaks will be in charge of the company's operating stations at Regina, Swift Current, Estevan, and Carnduff in Saskatchewan, and Virden in Manitoba. Oaks will make his headquarters in Regina.

Collum has been with McCullough 5 years, having started as a junior truck operator in Tyler, Tex., and progressing through the service department to sales, working at Great Bend, Kans., and Shreveport, La. Oaks began his oil-business career in 1927, working in the Mid-Continent area on production and drilling tools. In 1943 he worked in England for a drilling company, returned to the United States in 1944 and joined McCullough Tool, specializing in fishing tools and wire-line services in California and on the West Coast.

Five Guests Attend March Meeting of Houston Nomads

At the Houston March meeting of Nomads the following guests were present (left to right): Jack R. Hamilton, Gulf Oil Corp., Houston; Harold Vance, vice president, Bank of the Southwest, Houston; A. J. Thomson, Mosul Petroleum Co., Iraq; Kraus Earhadt, The Texas Co., Houston; Jack Ballagh, Tex-Lube, Inc., Los Angeles.

Speaker of the evening was Vance who discussed problems involved in applying for an oil loan.

Tyler to Manage Reed Roller Bit Subsidiary

F. L. Tyler has been appointed manager of Reed Roller Bit Co., (Nederland), N. V. Tyler was formerly Reed's Pacific Coast sales division manager in Los Angeles.

F. L. TYLER

Tyler has been with the Reed firm since 1940. He was engaged in the oil business both in this country and abroad for several years before his association with Reed.

Welex Appoints Sales Engineer, Station Manager

E. L. (Stub) Blackman has been appointed a sales engineer for the Gulf Coast division of Welex Jet Services, Inc., and Bob Colclasure has been named station manager of the office at Plainville, Kans.

Blackman, a veteran of 16 years of oil-well service work, returns to Welex after a 3-year absence. He was with the Gulf Coast division of Welex from 1949 to 1953.

Colclasure, who has been with Welex over 3 years, has served with the company as a trainee, shooter, and sales engineer at Great Bend, Kans.

Marsh and Hawk Appointed To New Sperry-Sun Posts

The appointment of Quentin B. Marsh and Charles E. Hawk to newly created positions has been announced by Sperry-Sun Well Surveying Co. Marsh is being transferred from Sperry-Sun of Canada, Ltd., where he served as vice president, to his new position as assistant to the general manager for sales. Hawk is promoted from chief engineer to assistant to general manager for manufacturing.

Q. B. MARSH

C. E. HAWK

Marsh joined Sperry-Sun in 1948 as sales and service engineer in the tri-state area for 3 years. For over 2 years, he served as manager of the

Houston sales district. In 1953 he moved to Alberta, Canada, where he managed the new Sperry-Sun subsidiary. In addition to his new duties in Houston, Marsh will continue as vice president of the Canadian operation. Hawk joined Sperry-Sun as an engineer in the research and development department.

Richardson Rejoins B & W As Sales Representative

Frank J. Richardson, Jr., has rejoined B & W, Inc., at its Houston headquarters in sales representation. After several years of sales and service work in Gulf Coast oil fields with B & W Richardson sold construction materials.

Douglas Wilson Helps Form French Equipment Group

D. WILSON

Douglas Wilson, who recently was succeeded by G. V. Sims as chairman of the Council of British Manufacturers of Petroleum Equipment in London, England, has assisted J. P. Le Gall in forming a similar organization in France, the Federation Europeen des Constructeurs D'Equipment, of Paris.

Le Gall has said "We feel that the formation of the federation helps to consolidate the trade and gives a mutual interest to European countries. This kind of association strengthens the western part of Europe and, with this in mind, I am most happy to take part in the running of this federation."

Gillhouse Is Sales Manager For Quincy Compressor Co.

L. GILLHOUSE

The appointment of Loren Gillhouse as sales manager of Quincy Compressor Co., Quincy, Ill., has been announced by the firm's president, Mac Irwin. Gillhouse assumes his new duties after 5 years as Quincy's assistant sales manager. He has also served as a regional sales manager for Quincy.

Klemp Names Oram Executive Director of Sales

The appointment of Dan W. Oram as executive director of sales has been announced by Klemp Metal Grating Corp. of Chicago. Oram was recently associated with Kerrigan Iron Works, Inc., as head of the market-development division.

Oram will serve as international executive director of sales for Klemp. His main office will be located in Chicago, and he will also maintain offices at the New York and Houston branches.

Crossett Appoints Gray Sales Representative

Lewis A. (Bullet) Gray has been appointed technical sales representative for Crossett Chemical Co. of Crossett, Ark., which markets Seeco-Mul, a drilling-mud emulsifying compound. Gray for the last several years was an engineer for two mud companies. He will make his headquarters in Wichita Falls, Tex.

Stratoflex Makes Thomas General Manager of Sales

C. A. THOMAS

Promotion of C. A. Thomas to general manager of sales has been announced by Ken W. Davis, president of Stratoflex, Inc. Thomas will continue to headquarter in Fort Worth, where he formerly served as sales engineer for the company. He will have charge of all sales activity of the organization.

Stratoflex, Inc., maintains offices in principal cities in the United States, has general offices and factory in Fort Worth and branch plants in Tulsa and Los Angeles. A subsidiary company, Stratoflex of Canada, Inc., maintains offices in three provinces of Canada and a plant in Toronto, Ontario.

Thomas has been with Stratoflex since 1950.

Darling Valve Announces Five Executive Changes

D. F. SABLE

Charles H. Schreyer, recently elected president of Darling Valve & Manufacturing Co., has announced several important personnel changes. Carl H. Simon is elevated to the position of vice president and general manager, assuming responsibility for all Darling-Valve operations. Dick F. Sable assumes the position of general sales manager, and Thomas C. Jester is chief engineer. James N. Elwood, former plant manager and general superintendent, becomes manager in charge of manufacturing. Packer B. Young, former assistant sales administrator, is promoted to assistant sales manager.

Sable was formerly Southwest regional manager and came to Darling from Magnolia Petroleum Research in 1945. He will retain his offices in Dallas, where the Southwest regional headquarters are located. Jester was formerly assistant chief engineer. He came to Darling Valve from General Electric in 1945 as metallurgical engineer. Elwood joined Darling in 1945.

Messinger Directs Baash-Ross Sales Conference

Under the direction of Hal Messinger, general sales manager for Baash-Ross Tool Co., division of Joy Manufacturing Co., sales managers from the various offices gathered recently for a 2-day conference in which the latest trends and developments within the oil industry were discussed. Around the conference table are shown: H. Klepfer, export manager, New York; P. Pound, sales manager, Mid-Continent area; Leo Cypher, sales manager, West Coast area; G. Huckabay, sales manager, eastern Gulf Coast district; G. Morrison, sales manager, Canadian area; E. Gearke, assistant general sales manager; H. Messinger, general sales manager; G. Johnson, vice president, Joy Manufacturing Co., general manager; O. Brown, manager rental and service; B. Bronzan, assistant general manager; B. Brenner, sales manager, Rocky Mountain area; H. Mays, sales manager, Permian Basin area.

Southwest Industries Promotes Firth and Tullis

Richard M. Firth has been promoted to vice president of production and engineering and Charles G. Tullis to chief engineer, according to Jay L. Cannon, Jr., president of Southwest Industries, Inc., of Houston.

Firth has worked with pressure vessels for the petroleum and chemical industries, anhydrous-ammonia installations, and with packaged gas compressors. Tullis' engineering and professional experience has been in the field of packaged gas compressors.

Williams Heads New Factory Branch for Hall-Scott

Hall-Scott Motors Co. has established a factory branch in Houston for special service to the petroleum industry. C. E. Williams has been appointed manager of the branch.

Axelson Introduces Field Training Program

Hydraulic pumping unit field representatives of the Axelson division of U. S. Industries, Inc., have been undergoing 3 weeks of intensive technical instruction in Los Angeles, according to an announcement by J. W. Rockwell, sales manager, hydraulic units.

The new educational program is being conducted by Axelson's petroleum technical section, with the prime purpose of equipping field men with specific engineering sales training in the application of both the hydraulic long-stroke and complete Hydrax line of oil-well pumping units in the 4, 6, and 10-ft. sizes.

Participating in Alexson's first training course were: E. C. Swain, Oklahoma City; A. R. Washburn, Axelson engineering department; C. C. Call, Wichita; R. E. Grigsby, Odessa; R. W. Reckstin, Axelson engineering department; W. B. Jennings, Midland; R. E. Quinn, Santa Maria, and R. C. Manning, Los Angeles.

Dean Brothers Pumps Holds Annual Sales Meeting

Sales representatives from the United States and Canada recently attended the annual sales meeting of Dean Brothers Pumps, Inc., at Indianapolis. One of the outstanding events of the 2-day meeting, directed by Noble Dean, Jr., executive vice president, and chairmanned by R. C. Bierck, general sales manager, was the unveiling of a new line of low-cost general-service pumps.

Those who attended the meeting are: Top row: Miles Scheffel, Dean Brothers Pumps, Inc.; W. G. Cleaves and Richard Hayes, Sommerville, Mass.; H. L. Patrick, Dean Brothers; Eugene Quattrochi, Sommerville; John Bausch, New York City; Vern McCoun, Dean Brothers; A. R. Ford, Detroit; Noble Dean, Jr., and Robert Krebs of Dean Brothers; Robert White, Pittsburgh.

Second row: Robert Silly, Toronto, Ont.; Charles Harsen, Dean Brothers; A. Alexander, Jr., New Orleans; A. W. Maxwell, Dean Brothers, New York City; Art Hoekstra, Jr., Buffalo, N. Y.; John Ryan and A. J. Herrmann, Dean Brothers; Stanley Zane, Chattanooga, Tenn.; Gene Whitacre, St. Paul; G. V. Polister, St. Paul; John Crowe, Akron, Ohio; G. A. Saas.

Third row: Ralph Beeson, Kansas City; Paul Van Valkenburgh, Tulsa; Lee Davey, St. Louis; Joe Nastav, Chicago; Larry McCubbin, New Orleans; Robert Hulbert, Berkeley, Calif.; J. K. McIntyre, Dean Brothers; R. D. Norton, Dean Brothers, New York City; Ed Mairs, Akron, Ohio.

Bottom row: James Perry, Chattanooga, Tenn.; L. T. Sogard; Warren Danaher, Milwaukee, Wis.; E. C. Davis, Philadelphia; R. C. Bierck, Dean Brothers. Also attending the meeting, but not shown in the picture, were John Dean, Stuart Reid, and Keith Huizenga, all of Dean Brothers.

Carey Appoints Turner Sales Promotion Manager

Robert F. Turner has been appointed sales promotion manager for The Philip Carey Manufacturing Co., Cincinnati, Ohio. For many years Turner has been a sales executive of Carey and is well known in the building-materials industry.

Porter Is Representative For Aerial Mapping Firm

W. V. PORTER

Hal Peterson of San Antonio and Kerrville, Tex., has purchased World Wide Cartography and International Mapping Corp. of San Antonio and has combined these two companies into one company to operate as International Aerial Mapping Co. He has moved these companies into a new building especially engineered, designed, and constructed for photogrammetry. The new plant is at the entrance to the International Airport in San Antonio.

William V. Porter has been appointed as representative to the oil, gas, pipeline, and power industry.

McCormick and Eadie Named by Pacific Pumps, Inc.

McCORMICK

J. W. McCormick has been appointed sales manager, centrifugal pumps division, and W. S. Eadie has been named New York district manager of Pacific Pumps, Inc., Huntington Park, Calif.

McCormick, previously Pacific's New York district manager, has been with the firm since 1941. Eadie was formerly sales engineer in Pacific's New York and Chicago offices.

Beyler Becomes Houdry Product Sales Engineer

Dudley Beyler has been appointed product sales engineer in the chemicals division of Houdry Process Corp. He joined Houdry in 1951 as a process-development engineer and more recently has been a commercial-development engineer in the research and development laboratories at Linwood, Pa.

CREATIVE BANKING

stops the waste of flare gas

Creative banking builds wealth from waste. Nowhere is this better proved than in a South Texas field where gas was being flared because pressure was too low for gathering lines. No single owner in the field was big enough to put in the necessary packaged gas compressors to boost the pressure. So this project, as another example of creative banking, was initiated and financed by The National Bank of Commerce. As a result, gas that was wasted is now sold at a profit.

Through knowing the producers' specific problems, The National Bank of Commerce was able to provide a solution that made money for everyone. The Oil Loan Department knows that financing must be flexible enough to meet changing conditions as they arise. So many oil men have been helped to build soundly and constructively. Creative banking can help you, too.

The experience and resources of The National Bank of Commerce of Houston are now being used in Wyoming, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, *Vice President, Oil Loan Department.*

THE NATIONAL BANK OF

COMMERCE

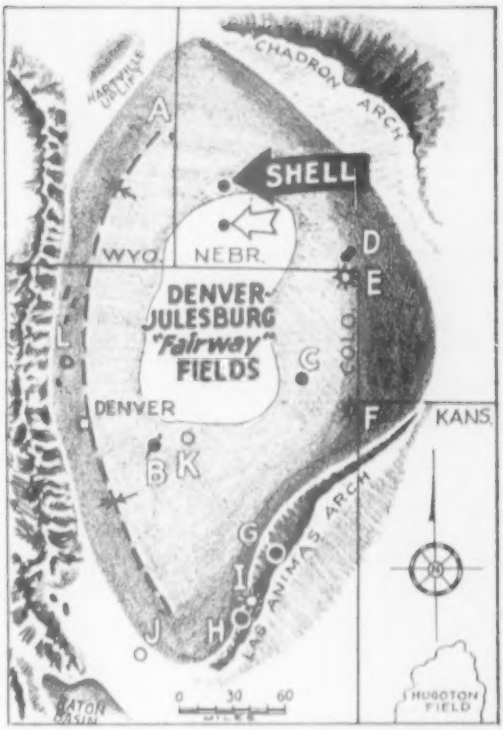
OF HOUSTON

Gulf Building — 712 Main Street

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

D-J Operators Look Toward New Horizons

by Frank J. Gardner



Shell Oil Co. has pushed Denver-Julesburg production to its northernmost point in Banner County, Nebraska, and recorded Pennsylvanian shows at Travis field in Kimball County. To the south, the Las Animas arch is promised its second oil field in Kit Carson County (G on map).

THINGS are happening in the Denver-Julesburg basin. And with the coming of spring, this busy bowl will teem with new activity for the rest of the year. Drilling last year reached a new high, and it's entirely likely that the pattern will be repeated in 1956.

A northward push . . . The center of interest in D-J in recent months has shifted northward to western Nebraska. As a result, that state shoved aside all other Rocky Mountain states to rank second only to Colorado in total drilling during 1955. Completed wildcats numbered 397, more than double the 182 finished in 1954. Land under lease in the state increased by a million acres during the year.

The gamble has paid off. Forty-one new Nebraska fields were opened in 1955, and 10 have been discovered since January 1. The past week, new emphasis has been placed on the play by the discovery of oil at Shell Oil Co. 1 Horn (large arrow on map). The success indicated at this Banner County well pushed the productive fairway to its northernmost point. At last report, Shell had placed the discovery on the pump, with no gage announced. But on a 2-hour test of the Dakota "J" sand at 5,062-70 ft., the operator reported a recovery of 2,230 ft. of oil, 120 ft. of heavily oil and gas-cut mud, and 100 ft. of mud-cut water. Later swabbing recovery was 33 bbl. of oil in 11 hours through ¾-in. choke.

And a deeper show . . . At the same time, the same operator reported another important bit of Nebraska news. Its 18 Travis, in Travis field (small arrow), Kimball County, had reached granite at about 8,430 ft. and had recovered 100 ft. of free oil and 4,600 ft. of salt water from a Pennsylvanian dolomite-anhydrite zone at 7,281-98 ft. This is the first deep test in this area, and the first to find free oil from pre-Cretaceous rocks in the Nebraska portion of the basin. It reached a total depth of 8,441 ft. and was plugged back for completion in the Dakota "J," but the significance of the Pennsylvanian showing cannot be overlooked.

Torrington field in Goshen County, Wyoming (A on map), is still D-J's northern production outpost, and the coming months will no doubt see new probing of the 48-mile stretch between Torrington and the new Shell strike.

And so D-J grows. Last year saw its southern perimeter pushed out by the discovery of Bradbury field (B on map), a short-lived pool but an important feeler into the basin depths. Its eastern front stepped out 28 miles when Hyde field was uncovered (C on map). Its deeper possibilities were emphasized by Permian strikes in Weld and Larimer counties, Colorado, and now by Pennsylvanian shows in Nebraska. At D and E on the map are east-edge gas fields that produce from Dakota "D" sands, and at F is an abandoned field (Wray) that produced Niobrara gas as early as 1925. These east-edge pools indicate that this sparsely drilled part of the basin merits detailed investigation.

Plus a new field . . . Meanwhile, down on the arch—Las Animas, that is—another epic event may be shaping up. At G on the map, a lonesome wildcat is promising a second oil field for this scarcely drilled uplift. Here, Harry Royster and New Drilling Co. have reported recovery of 12 bbl. of oil per day from the Lansing-Kansas City (Pennsylvanian) section at 5,507-19 ft. If completed as a discovery, this will give Kit Carson County its first oil field. Operators were swabbing for tests at this writing.

The only other oil production on Las Animas Arch is at Bent's Fort field (H on map), a 1955 discovery dually completed for 440 M.c.f. gas daily from Morrow-Pennsylvanian sand at 5,203-27 ft. and 50 bbl. oil per day from Atoka-Pennsylvanian at 4,619-31 ft. A few miles to the northeast of Bent's Fort is a single shut-in gasser (I on map) known as McClave or Southwest Eads (depending upon whose map you're reading); Continental Oil Co. found this one in 1952, with small production from Morrow sand.

Point to new vision . . . All these events point to a broadening vision on the part of D-J operators; they are at long last raising their sights from the concentrated play along the fairway and taking a look at the outer rims of the basin and its environs. At J, K, and L on the map are three remote wildcats that were announced this week, in Pueblo, Arapahoe, and Boulder counties, respectively. Aggressive wildcatting like this will spell discovery.

A.A.P.G. ABSTRACTS

. . . of selected papers presented at the sixth annual meeting of the Rocky Mountain section at Denver. Theme: "Tectonic framework of the Rocky Mountains."

Introduction to the Tectonics Of the Rocky Mountains

D. L. BLACKSTONE, JR., University of Wyoming, Laramie.

PURPOSE of technical meetings is to disseminate to the profession viewpoints which will aid in the discovery of petroleum reserves. Since the Rocky Mountain section operates over a large area of tectonic complexity most exploration programs demand geologic investigation from a structural viewpoint. Attempts to reconstruct geologic history will be facilitated if existing structures are understood with certainty. Five major tectonic divisions are proposed for the Rocky Mountain region as a framework for discussion of some local areas. The term tectonics is used in the original sense as a synonym for structural geology to denote presently existing geologic features caused by diastrophism and excludes usage which implies that tectonics is a process. The study of tectonics is not alone the answer but it remains a pick that is far from dull.

The Rocky Mountain system extends from the Liard River, B. C., to Santa Fe, N. M., and is the dominant geological feature within the seven-state Rocky Mountain section. Five tectonic divisions based on the present structural position of the Precambrian crystalline basement exist within the system and the adjacent eastern area. The divisions are: Canadian shield; thinly covered shield; area of locally exposed basement; area of deeply buried basement; and the area where the basement is no longer recognizable.

Pre-Cambrian rocks exposed over large areas of Canada collectively form the Canadian shield. The exposed basement is bounded in Alberta and Saskatchewan by overlying sediments. The surface upon which the overlying sedimentary rocks were deposited is warped into a major syncline the steeper limb of which lies in or near the disturbed belt of Alberta and Montana and along the Rocky Mountain front. In this syncline the basement is covered by a relatively thin veneer of sediments except for local areas such as the Williston basin. Petroleum accumulation in the area of thin sedimentary cover is controlled more by stratigraphic than by structural factors.

The area of local exposure of the pre-Cambrian basement includes the southern Rockies, the Wyoming basin, and part of the Middle Rocky Mountain province. Prior to deformation the basement was thinly covered by sediments. Anticlinal mountain ranges and deep local intermontane basins characterize the region. The site of deformation was localized by the Pennsylvanian structural history. Petroleum accumulation is largely controlled by geologic structure.

The pre-Cambrian basement was deeply depressed beneath the troughs existent in Central Utah, western Wyoming, eastern Idaho, western Alberta, and eastern British Columbia during late pre-Cambrian and early Paleozoic time. Deformation of the troughs created the overthrust belt characterized by repetition of the sedimentary sequence in overthrust fault plates. Absence of pre-Cambrian basement rocks in the thrust plates suggests that faulting is localized in the sedimentary sequence. Accumulations of petroleum have been negligible in this division.

The pre-Cambrian basement complex is no longer recognizable in the areas of batholithic intrusion in Idaho, Montana and British Columbia. The development of granite and granite gneiss in the Idaho batholith, age 100 million years, modified the preexisting rocks, and substituted a new floor for subsequent geologic history.

Lineaments of primary significance are superimposed across the tectonic divisions. The lineaments have complex geologic histories in which transverse movement was probably important. The prominent lineaments are: Rocky Mountain Trench, Montana lineament, Wyoming lineament, and the Walker lineament, all of which separate regions of differing geology.

Volcanically derived materials of Cenozoic age are widely spread across the Rocky Mountain system, and reflect igneous activity of great magnitude. Extensive tectonic adjustment took place by means of normal and reverse faulting both during and subsequent to the deposition of the volcanic products. The extent and magnitude of the late Cenozoic faulting is as yet incompletely understood. Critical discrimination should be made between fault systems of different ages.

Petroleum accumulation in the Rocky Mountain region has been strongly influenced by regional as well as local tectonic features. Continued detailed tectonic studies are urged.

Tectonic History of the Raton Basin With Special Reference to the Late Paleozoic

GENE L. SHAW, American Stratigraphic Co., Denver.

DURING early Pennsylvanian time the Ancient Apishapa Sierra Grande, a linear mildly positive element trending 45 degrees west of the present strike of the Sierra Grande uplift, extended across the Raton basin and connected with the strongly positive Front Range element. Seas surrounded the Ancient Apishapa Sierra Grande except on the extreme northwest where it connected with the old Front Range. Marshall Kay's Zeugogeosyncline of Colorado and northern New Mexico bounded the west side of the mildly positive Ancient Apishapa Sierra Grande and the east side of the mildly positive Uncompahgre. In early Pennsylvanian time a relatively small quantity of arkosic clastics were carried into adjacent seas from the Ancient Apishapa Sierra Grande and the Uncompahgre. The Front Range, however, yielded vast quantities of arkosic debris toward seas to the east during Atokan and Des Moines time. Orogenic activity along the Front Range is recorded in the coarse clastic Fountain formation which grades laterally into early Pennsylvanian marine sediments as well as late Pennsylvanian marine sediments.

Shortly after Cherokee time a major alteration occurred in the tectonic framework of South Central and southeastern Colorado. The Uncompahgre was strongly uplifted along its east side and the Ancient Apishapa Sierra Grande subsided to receive coarse arkosic clastics during late Pennsylvanian time. This writer believes the Sangre de Cristo formation in the Raton basin area is Missouri and Virgil age representing a near source clastic deposit with few interfingering marine limestones. Subsidence of the Raton basin area during Missouri and Virgil time was not uniform. A subsiding east-west trough developed along the New Mexico-Colorado border in the Raton basin connecting with the north-south subsiding Colorado and northern New Mexico Zeugogeosyncline. The present configuration of the Apishapa and Sierra Grande uplifts came into existence during Missouri and Virgil time as linear features bounding the more rapid subsiding east-west trough along the Colorado-New Mexico border.

Uplift on the west side of the Uncompahgre near the close of the Pennsylvanian period caused regional tilting to the east producing an unconformity at the top of the Sangre de Cristo formation. Rocks of known Permian Leonard age do not interfinger with arkoses of the Sangre de Cristo formation but rest unconformably on Sangre de Cristo rocks and pinch out by onlap along the west side of the Raton basin.

Except for minor erosion during early Triassic time, the Raton basin area received sediments during the Mesozoic era until the late Cretaceous Laramide orogeny. The Colorado and northern New Mexico Zeugogeosyncline was the center of strong Laramide uplift creating the Sangre de Cristo Mountains, and minor Laramide uplift gave rise to the present Apishapa and Sierra Grande topographic features.

Structural Control of Oil Fields in the Wind River Basin, Wyoming

H. H. R. SHARKEY, Carter Oil Co., Denver.

THE Wind River basin of Central Wyoming is a typical intermontane tectonic depression. It was formed by the Laramide orogeny at the end of Mesozoic time, and during the early stages of the Tertiary.

Throughout the Paleozoic and Mesozoic eras the stratigraphic record shows that the area of the present basin was a portion of the eastern marine shelf of the Cordilleran geosyncline. A conformable sequence of 10,000 to 12,000 ft. of predominantly marine sediment was laid down prior to the period of mountain building.

The Laramide orogeny was manifested by southward and westward compressional forces which developed major overthrust mountain belts. These ranges, the Wind River Mountains west of the basin, the Owl Creek Mountains to the north, the Granite Range to the south, and the Powder River lineament to the east formed a parallelogram around the Wind River basin.

The orogenic movements were also effective through the basin in forming numerous anticlinal folds. These folds may be classified in four major groups: (1) a series of north-trending anticlinal axes projecting basinward from the Granite Range and including features like Sand Draw; (2) along the east side of the Wind River Mountains, in the westward portion of the basin is a series of asymmetric folds owing their origin to crustal shortening; productive structures include Dallas, Derby and Winkleman; (3) the major overthrusts of the Owl Creek Mountains and of the Powder River lineament have caused the development of major down-buckling along the north and east flanks of the basin; there are a few anticlines in these zones—West Poison Spider is an example; (4) in the northwest quadrant of the parallelogram is

a group of anticlines formed under a combination of the stresses outlined in (2) and (3) above; the combination of compressive movements from the Owl Creek Mountains to the north, plus the crustal shortening induced by the uplift of the Wind River Range resulted in a series of folds including Steamboat Butte, Circle Ridge and others.

Almost the entire oil production of the basin is obtained from structural traps whose origin was the Laramide orogeny. This event developed as the primary significant interruption to the regional continuity of the various marine formations, and therefore it was of primary importance in the localizing and accumulating of oil. Almost all the exploratory test wells drilled in the Wind River basin were drilled on anticlinal structures. This form of exploration has been very successful, and the more obvious anticlines have been drilled.

Future prospecting will undoubtedly consist of geophysical work, to find the more subtle structures, plus subsurface geology to find stratigraphic traps similar to the two most recent discoveries in the Wind River basin.

Tectonic Setting of Happy Springs And Nearby Structures in the Sweetwater Uplift Area, Central Wyoming

WALLACE G. BELL, Gulf Oil Corp., Casper, Wyo.

THE Happy Springs, Crooks Gap, Kirk, and Sheep Creek oil fields are situated along the Green Mountain-Crooks Mountain trend in southeastern Fremont County, Wyoming.

Structurally, the fields lie within the southwestern part of the Wind River basin, near the western end of the so-called Sweetwater Arch.

The main structural features of the area were formed by Laramide compressive forces and consist of (1) several easterly trending shear zones, and (2) a series of northwest-trending folds and associated thrust faults. The folds and shear faults formed concommitantly in response to Laramide compressive forces. The shear faults divide the area into several elongate blocks and developed to accommodate different deformational patterns within the blocks.

Happy Springs and adjacent fields consist of tightly folded, thrust faulted, northwest-trending anticlines formed en echelon on the south side of an easterly trending shear zone. These folds represent crustal shortening in the block lying south of the shear zone. The features in which crustal shortening is manifested in the block north of the shear zone are located about 10 miles west of the Happy Springs area in the large Mormon Trail anticline and thrust fault. The shear zone is a line of release that developed between the two blocks when they responded differentially to compressive forces.

The main accumulation of oil in the Happy Springs and Kirk fields is in the deformed strata along the foot-wall of the shear zone.

Tectonics of the Wasatch Plateau And Nearby Areas

WILLIAM LEE STOKES, University of Utah, Salt Lake City.

THE Wasatch Plateau of South Central Utah is a large tablelike remnant of high ground not yet destroyed by the general erosion of the Colorado River system. The basic structure is monoclinal with a regional westward dip that is gentle on the east and steep on the west. Superimposed on the basic structure is a broad anticline, the Monument Peak uplift, consisting of two folds that plunge slightly east of north into the Uinta basin. These folds, in turn, are modified by a north-trending system of fault zones which fall into the North Gordon, Pleasant Valley and Joes Valley zones. The Joes Valley zone is largest, having a total length of about 75 miles and an average width of 2 miles. It and the other zones are splintered by numerous small faults and the downward displacement reaches a maximum of 3,000 ft.

The regional westward dip of the plateau is related to the origin of the San Rafael swell. The greatest folding of the swell must have been post-Cretaceous pre-Eocene by analogy with the Waterpocket fold to the south. Since the Monument Peak uplift shows structural alignment with the swell it probably originated at the same time.

The complex fault zones are obviously of later origin. They are tensional features and cut all surface rocks including Pleistocene moraines. They are related to the deep seated Wasatch monocline and probably to subsidence and solution effects in the salt-bearing Jurassic rocks below. The western flank of the Wasatch plateau is complex with numerous faults, unconformities and landslides. This complexity may be due to growth and collapse of salt structures.

Oil Producing Structures as Related To Major Tectonic Features in the Rocky Mountain Area

GEORGE R. DOWNS, Consultant, Denver.

THE oil and gas-producing structures of the Rocky Mountain area may be classified according to their genetic relationship to major tectonic features. Patterns established by this classification may be helpful in searching for unknown structures. Producing anticlines and domes are considered to be subsidiary or secondary structures which were formed by the same forces and created at the same time as the more obvious large features. Based on past experience, favorable environments for new discoveries may be expected (1) in the zone of adjustment between mountain uplifts and basin blocks; (2) in front of thrust sheets; (3) above basement faults; (4) as "warps" in broad basin areas; (5) at terminal parts of mountain uplifts or arches; (6) above igneous intrusives. It is suggested that by "working backward" from known major tectonic features that subsidiary structures may be found which will prove to be effective oil and gas traps.

Tectonics of Central Wyoming

RAYMOND M. THOMPSON, Consultant, Denver.

CENTRAL WYOMING is bounded by mountain ranges which have moved along complex thrust faults. Some of these ranges lie upon or very close to the basin deeps. Subsequent adjustment by normal faulting has further complicated much of the area. Crustal shortening is demonstrated, whereby tightly folded anticlines have formed within the basins and have moved along thrust faults upon the mountain flanks. The area apparently acted under the conditions of plastic deformation, in response to a series of pulsating movements affecting the entire Rocky Mountain area during Laramide time.

The tectonic pattern of the area was influenced by the sedimentary column. A relatively thin column of Paleozoic and Mesozoic rock represents transgressive overlap from the Cordilleran geosyncline. This thin column occupied a relatively stable area until Laramide time. Regional isopach work, however, indicates broad gentle arching throughout the sedimentary history. As early as Frontier time considerable local relief was present, and some folds were overturned in pre-Paleocene time.

Oil and gas accumulations are the best-known end result of the tectonic environment. Mineral deposits, particularly uranium, appear to be intimately related to structural conditions in the area.

Tectonics of Central Montana

JAMES O. STAGGS, McAlester Fuel Co., Billings, Mont.

CENTRAL MONTANA has been tectonically active at least since pre-Devonian time. This activity has been in seven stages: (1) pre-Cambrian to post-Devonian uplift and erosion; (2) early Mississippian Big Snowy downwarp; (3) Heath uplift; (4) pre-Jurassic epeirogeny; (5) late Laramide orogeny; (6) late Eocene or post-Eocene igneous intrusions; (7) pre-Pleistocene epeirogeny. The late Laramide orogeny and late Eocene or post-Eocene igneous intrusions account for the asymmetrical (Big Snowy Mountains) tectonic features and the laccolithic domes (Judith Mountains) visible today. Accumulation of oil in Central Montana is found in both structural (Cat Creek field) and a combination of stratigraphic and structural traps (Northwest Sumatra field). Geologically the oldest producing horizon is the Mississippian Kibbey sand (Ragged Point field) and the youngest horizon is the Lower Cretaceous First Cat Creek sand (Cat Creek field).

The conclusion can be made that Central Montana tectonics were not restricted to Laramide time. Oil has been found in lenticular or isolated sandstones but very little has been found in the widespread sandstones of the Jurassic and Lower Cretaceous. One may speculate that oil which initially accumulated in these sands migrated from the Central Montana area or its margins prior to the late Laramide orogeny. The subsequent cropping out of the Jurassic and Lower Cretaceous strata during late Laramide deformation and erosion caused an increase in formation hydrostatic pressures making it more difficult for the oil to migrate back into Central Montana and into the present structures.

Tectonics of the Paradox Basin And Its Relation to Oil Occurrence

GREGORY K. ELIAS, Gulf Oil Corp., Durango, Colo.

THE Paradox basin is defined as the areal extent of the Pennsylvanian evaporitic Paradox formation in the Four Corners area.

Two areas of uplift, the Fort Defiance and San Luis, influenced sedimentation throughout the entire Paleozoic. The Uncompahgre uplift came into existence during early Pennsylvanian time and remained active through the Permian.

Possible stratigraphic traps are postulated for the Devonian and Mississippian sediments in the proximity of the Fort Defiance and San Luis uplifts. Tectonism during the Pennsylvanian has given rise to potential reef production in beds bordering the evaporite basin. Stratigraphic porosity trends within the Paradox Evaporite basin have yielded oil and gas. The major duty of the stratigrapher will be to determine the porosity belts. Sand pinchouts may be expected in proximity to the uplifted areas in both Pennsylvanian and Permian sediments.

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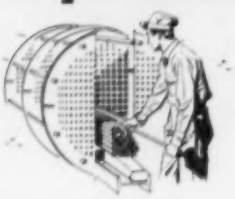

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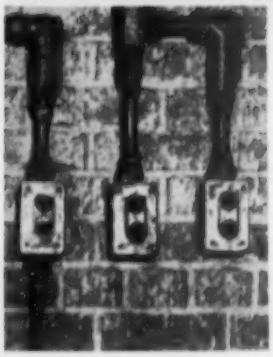

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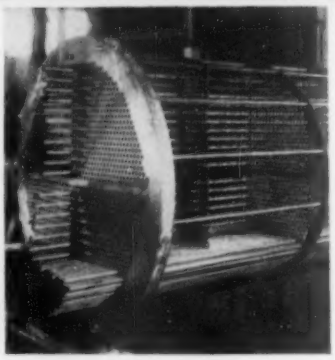

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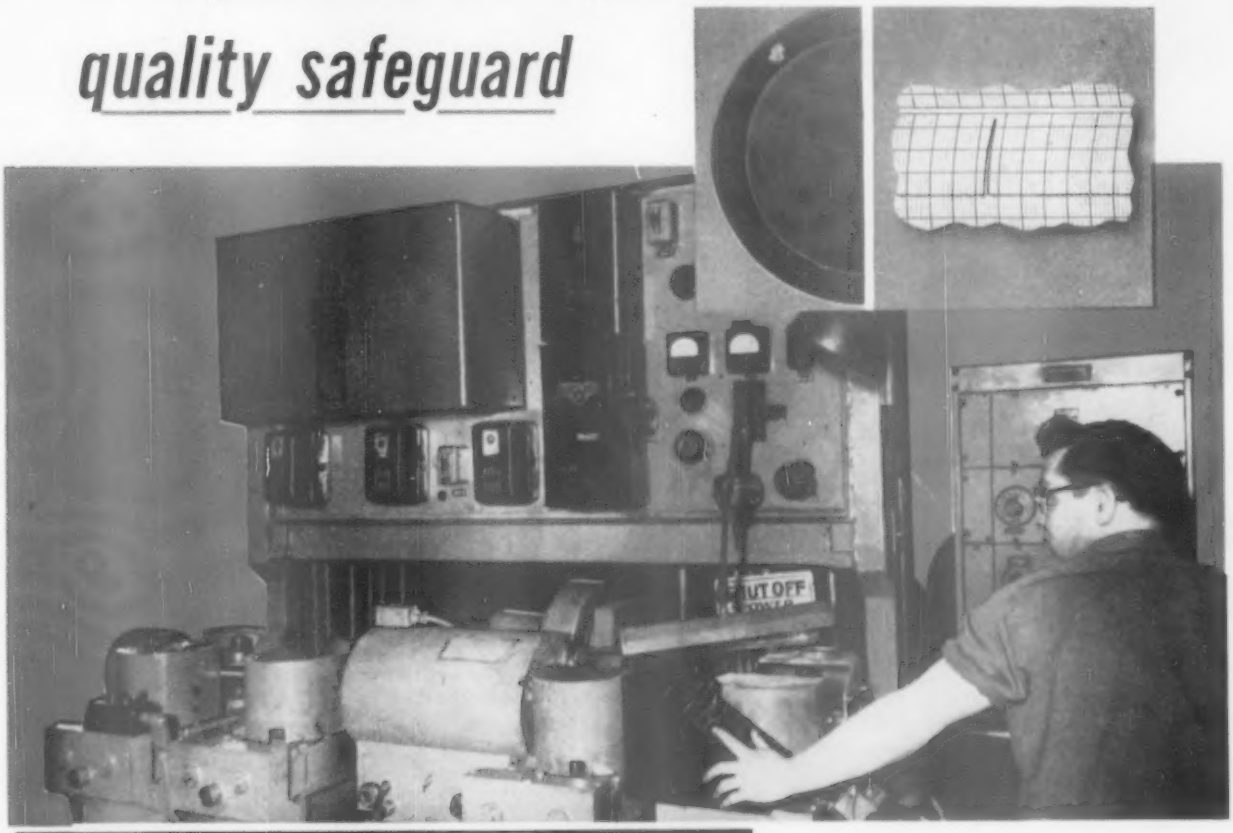

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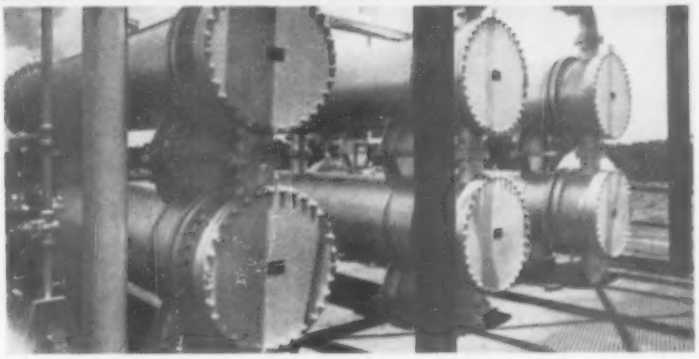

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OHIO'S 1955 DRILLING SCORE

Stable Prices, Plus Hydraulic Fracturing, Boost Buckeye Output

by J. C. Wilson
and George G. Shearrow

Fig. 1—State map of oil and gas-producing trends and fields.

MORE widespread use of hydraulic fracturing brought an increase in crude oil production in Ohio last year. A total of 546 wells were completed by this method of fracturing. The favorable results encouraged more activity in the Clinton trend fields. The stability of crude prices and increases for Buckeye and Zanesville-Pennsylvania grades plus lack of prorating also gave encouragement to the industry in Ohio. Increased costs to the contractors and producers of other grades of oil have had no appreciable effect on the number of completions.

. . . Crude-oil production—up 11.3 per cent over 1954 to a total of 4,327,000 bbl.

. . . Gas production increased to a total of 35,081,000,000 cu. ft.

. . . Well completions—of the total of 1,234 new wells in 48 counties, 27.2 per cent were dry holes. The initial production discovered by new wells was 151,588,000 cu. ft. of gas and 37,758 bbl. of oil. Total footage drilled was 2,486,174 ft.

Forty per cent of the wells drilled were Clinton tests of which 84 per cent were successful. Ninety per cent of the initial crude and 62 per cent of the gas discovered in 1955 came from the Clinton sands. The average production per successful Clinton well was 93 bbl. of oil and 389 M.c.f. of gas.

Of the 32 wells drilled deeper, the results were: 2 oil, 17 gas, 6 combination, and 7 dry holes. The additional footage drilled was 10,383 ft.; additional initial production discovered was 97 bbl. of oil and 10,048,000 cu. ft. of gas.

Authors are, respectively, oil and gas inspector, Ohio Division of Mines, and head, subsurface section, Ohio Division of Geological Survey.

Distribution of Drilling

Almost one-third of the drilling was done in three counties. Ashland County had 110 wells drilled . . . nearly all

TOTAL FOR ALL TYPES OF WELLS COMPLETED

Type of well—	No. of wells	Production		No. feet drilled
		Gas (M.c.f.)	Oil (bbl.)	
Gas:				
New	247	102,968		454,110
Drilled deeper	17	9,547		6,149
Storage	34			111,140
Oil:				
New	372		17,389	749,343
Drilled deeper	2		10	54
Combination:				
New	279	48,620	20,369	725,137
Drilled deeper	6	501	87	1,715
Dry:				
New	336			557,584
Drilled deeper	7			2,465
Water flooding	36			33,298
Brine and salt tests	8			18,140
All types:				
New	1,234	151,588	37,758	2,486,174
Drilled deeper	32	10,048	97	10,383
Gas storage	34			111,140
Water flooding	36			33,298
Brine and salt tests	8			18,140
Total	1,344	161,636	37,855	2,659,135

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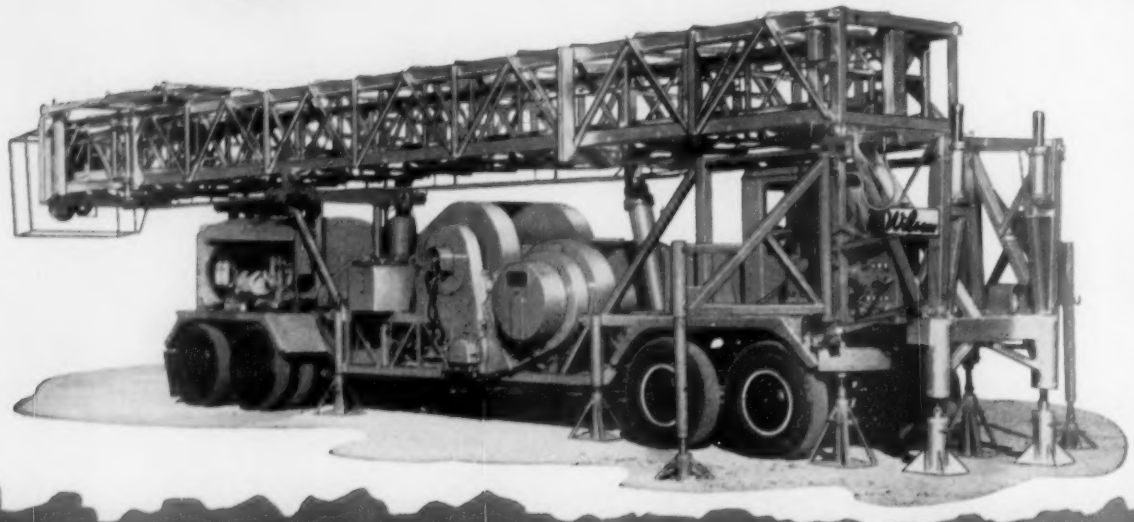

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- Parkersburg 15" double Hydrotarder with Air-Tube clutch.
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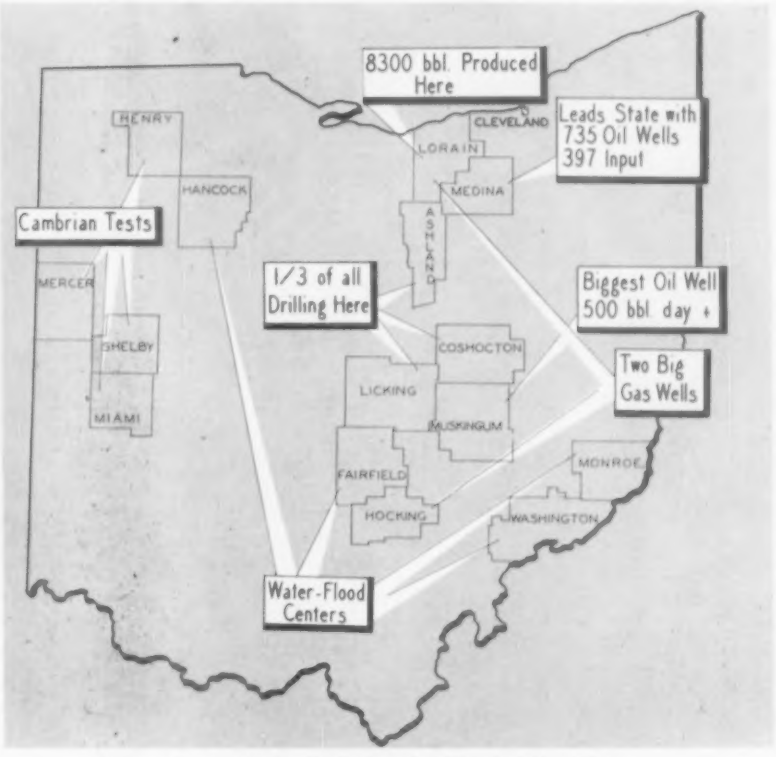

Fig. 2—County distribution of drilling in Ohio, 1955.

of them Berea wells. Coshocton County had 116 wells, most of them Clinton tests. Licking County leads in the total number of wells drilled per county. Of the 138 wells drilled, 110 were Clinton, 20 were Berea, 3 were Newburg, 2 were Medina, and 3 were Ohio shale. Fewer than 17 per cent of them were dry holes.

The largest oil well reported was over 500 bbl. per day. It was drilled in Muskingum County, one of the 11 counties that had 50 or more wells completed.

Hocking and Lorain counties had gas wells reported of 6,240 M.c.f. and 8,960 M.c.f., natural, respectively. Several other wells made over 5,000 M.c.f. initially, but these were after fracturing.

Cambrian exploration . . . Sun Oil Co. drilled two wildcats in western Ohio to test the Cambrian sediments. The 1 Robert Levering, Section 3, Washington Township, Miami County, was abandoned after drilling to 3,411 ft.

The 1 Donald M. Nelson, Section 24, Perry Township, Shelby County, total depth 3,276 ft., was also dry with a small show of oil in the upper part of the Trenton. Sun reports the granite was found in the Levering well at 3,373 ft. and in the Nelson well at 3,180 ft.

Two other wells penetrated the top of the Cambrian, but no production was found in that horizon. The 3 Urban Ables, Section 35, Gibson Township, Mercer County, was plugged back and made a small oil well in the Trenton. The Otto Inselman well, Section 22, Richfield Township, Henry County, had a small show of oil and gas in the Trenton.

Guide to Producing Formations

PENNSYLVANIAN:
First Cow Run, Allegheny, Second Cow Run, Salt Sand group, Maxton.
MISSISSIPPIAN:
Big lime, Keener, Big Injun, Squaw, Berea.
DEVONIAN:
Ohio shale, Oriskany.
SILURIAN:
Clinton, Medina.
ORDOVICIAN:
Trenton, St. Peter.

Water-Flooding Results

Area water-flooding permits totaled six during 1955. Carroll, Fairfield, Hancock, Monroe, and Washington counties were the centers of activity. Fifty-one wells were completed for flooding and eighty-eight were plugged. Eighty-one of the wells plugged were in the Medina-Chatham area. The estimated number of wells in all areas are 764 oil and 419 water input. The Chatham Township, Medina County area, continues to lead all other areas with 735 oil and 397 water-input wells. The estimated production was 240,000 bbl., of which 8,300 bbl. was produced from Penfield Township, Lorain County. The total production figures from all areas are not available.

Acknowledgment

The Division of Geological Survey and the Division of Mines wish to acknowledge the many contributors who have made the 1955 oil and gas report possible. The following organizations and individuals have been especially helpful: Ohio Oil and Gas Association for crude prices, oil production and drilling reports; Ohio Fuel Gas Co., Kenneth Cottingham, Lyle Kirk, and Allan Johnson for gas production, reserves, underground storage and wells drilled deeper; the Ellis Myers Gas Co. for gas-storage data; D. T. Ring for oil-reserves data.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Natol Corp.'s second test on the Wm. Bucy tract, Section 6, Killbuck Township, Holmes County, was an oiler after finding only gas in the 1 Clinton was found at 3,508-26 ft. and gaged 130 bbl. with 200,000 cu. ft. gas after fracturing. In the same township, Ditch and Hanna extended the pool with a 200 bbl. producer on 1 W. R. Baker, Section 4. Clinton at 3,528-3,560 ft. made a good showing before treatment.

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Hope Natural Gas Co. wildcat, 9957 U.S.A., Department of the Interior, elevation 3,178 ft., had a final gage of 7,925,000 cu. ft., gas after Sandfrac, chert 5,069 ft., Oriskany sand 5,216-5,402 ft., gas 5,397-5,401 ft., TD 5,408 ft. The rock pressure was 2,005 psi. in 24 hours.

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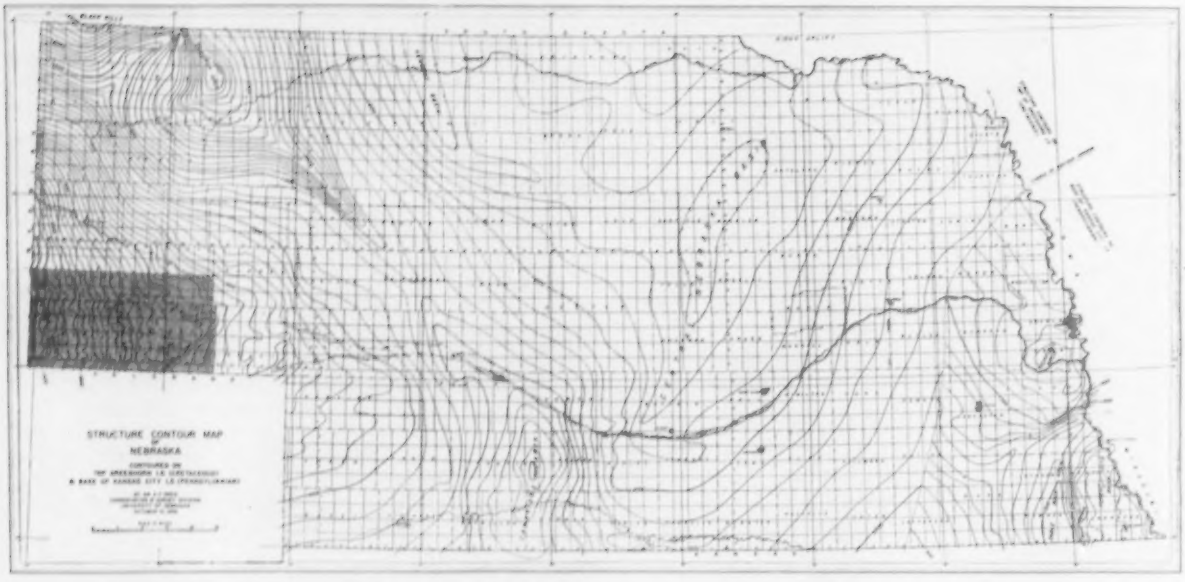

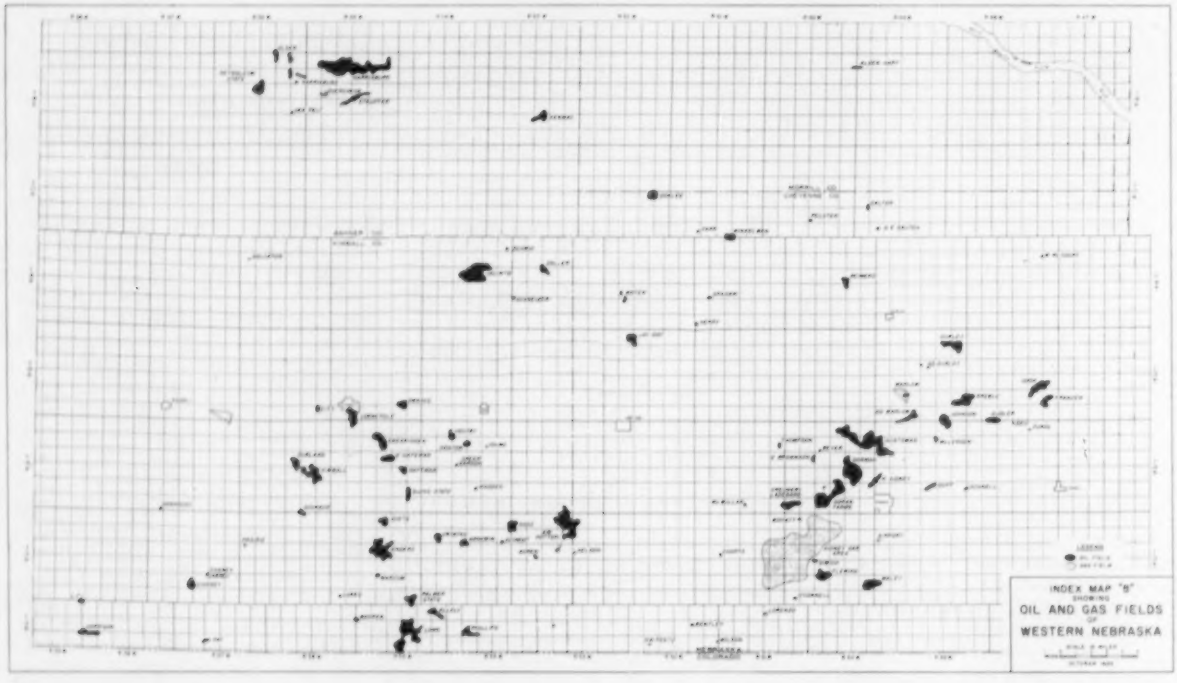

Denver-Julesburg Interest Shifts to Birthplace

DENVER-JULESBURG basin activity has intensified in Nebraska during recent months. This trend is noticeable in view of nearly 3 years of neglect to that state while operators concentrated greater force on the search for oil and gas in Colorado. Completions and production are at all-time highs in Nebraska. Now with the help of the Nebraska State Geological Survey, the Rocky Mountain Association of Geologists has presented the industry with an important new book. It is a compilation of the freely exchanged thoughts of Rocky Mountain geologists, and it fills a great need for information on the booming Nebraska portion of the Denver-Julesburg basin.

This new publication, "Oil and Gas Fields of Nebraska," is a companion volume to "Oil and Gas Fields of Colorado," published by the R.M.A.G. in 1954.

Exciting history . . . The history of exploration and development in this busiest of Rocky Mountain oil provinces has been a fast, exciting one.

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Magna Oil Corp.
Manabi Exploration
Maracaibo Oil Explor.
Middle States Petrol.
Midwest Oil Corp.
Mission Corporation
Mission Development
Monterey Oil Co.

Oceanic Oil Co.
Ohio Oil Co.

Pacific Western Oil
Pancoastal Petroleum
Panhandle Oil Corp.
Pan-Israel Oil Co.
Pantepec Oil Co.
Phillips Petroleum
Plymouth Oil Co.
Pubco Development
Pure Oil Co.

Quaker State Oil Ref.

Richfield Oil Corp.
Royal Dutch Petroleum

Seaboard Oil Co.
Shamrock Oil & Gas
Shell Oil Co.
Signal Oil & Gas
Sinclair Oil Corp.
Skelly Oil Co.
Socony-Mobil Oil
Southern Production
South Penn Oil Co.
Southland Royalty Oil
S.O. of California
S.O. of Indiana
S.O. of Kentucky
S.O. of New Jersey
S.O. of Ohio Co.

Sun Oil Co.
Sunray-Mid Continent
Superior Oil of Calif.

Tejon Ranch Co.
Texas Co.
Texas Gulf Producing
Texas Pacific Coast
Texas Pacif. Land Trust
Toklan Oil Co.
TXL Oil Corp.
Tidewater Oil

Union Oil & Gas Corp.
Union Oil of California
Universal Cons. Oil

Venezuela Syndicate

White Eagle Oil
Wichita River Oil
Wilcox Oil Co.
Woodley Petroleum

CANADIAN OIL STOCKS

Ajax Petroleums
Amurex Oil Co.
Anglo-Amer. Explor.

Bailey-Selburn Oil
Banff Oil, Ltd.
British-American Oil

Calgary & Edmonton
Canada Oil Lands
Canada Southern Pet.
Cdn. Atlantic Oils
Cdn. Devonian Pets.
Cdn. Homestead Oils
Cdn. Petrofina
Canadian Pipelines & Pets.
Canadian Prospect
Cdn. Williston Minerals
Canso Natural Gas
Canso Oil Producers
Central Explorers
Central Leduc Oils
Charter Oil Co.
Cons. Mic Mac

Devon-Leduc Oils, Ltd.
Dome Explor. (Western)

Fargo Oils, Ltd.

General Petroleums
Great Sweetgrass Oils
Gridell Freehold Leases

Home Oil Co., Ltd.
Hudson's Bay Co.
Husky Oil & Refining

Imperial Oil Co.
Interprovincial Pipe

Jupiter Oils, Ltd.

Kroy Oils, Ltd.

Liberal Petroleums

McColl-Frontenac
Merrill Petroleums

National Petroleums
New British Dominion
New Superior Oils
North Canadian Oils

Pacific Petroleums
Peruvian Oil & Minerals
Prairie Oil Royalties

Royalite Oil Co.

Sapphire Petroleums
Scurry-Rainbow Oils
Security Freehold

Trans Empire Oils
Trans Mt. Oil Pipe L.
Triad Oil Co.

United Oils

Western Leaseholds
Wilrich Petroleums

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New developments indicate *sharp price advances* ahead for certain issues . . . a sidewise trend in others . . . declining prices in still others. By holding and buying the right stocks . . . selling others—you can make *big oil profits* in the period immediately ahead . . . and *prevent losses.*

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Southwest Nebraska. The Nebraska play fanned out in all directions following that discovery, embracing northeastern Colorado and Cheyenne, Kimball, Banner, Deuel, and Morrill counties, Nebraska.

Busy development . . . The past 18 months have been the busiest in Nebraska's oil history. Production of crude oil has been near the 30,000-bbl. per day mark for the past year. New pipeline outlets, the faith of major operators and independents in the area's future, and the rapid development of new pools in the area promise a glowing oil future for Nebraska.

Open exploratory vistas . . . Nebraska's bright promise has stimulated new exploratory interest in sparsely tested corners of the state.

The usual drilling heat is on in earnest in the southwestern counties. Last year a small oil discovery on the Cambridge arch in southern Nebraska lighted the way for new interest in the potentialities of this vast area. Heavy leasing in recent months on the long Chadron arch in northwestern Nebraska set off an exploratory program in that section. A glance at the accompanying structure map of the state, taken from the new book, will point up to the oil hunter the vast areas of Nebraska still unproductive, but highly promising. The whole center of the state (the Central Nebraska basin), the Chadron and Cambridge arches, and the northern extension of Kansas' Salina basin offer tremendous areas for consideration. This timely book will open Rocky Mountain and Mid-Continent exploratory eyes. It may be obtained from the Rocky Mountain Association of geologists in Denver.

MID-CONTINENT

OKLAHOMA

McClain Discovery Flows Oil From Bromide Sands

Gulf Oil Corp.'s discovery in McClain County, the 1 Dryer, flowed 38 bbl. of oil in 1 hour on drill-stem test at 10,122-53 ft. in the Bromide sand. Gas flow was 1,500 M.c.f. per day. Recovery on the test was 1,400 ft. of oil.

The first test at 10,101-22 ft. unloaded 30 bbl. of oil in 2 hours and yielded 6,080 ft. of 36°-gravity oil. Commercial oil was also indicated in the Hunton lime at 9,000 ft. Location of the discovery is in SE SW NE 20-6n-3w.

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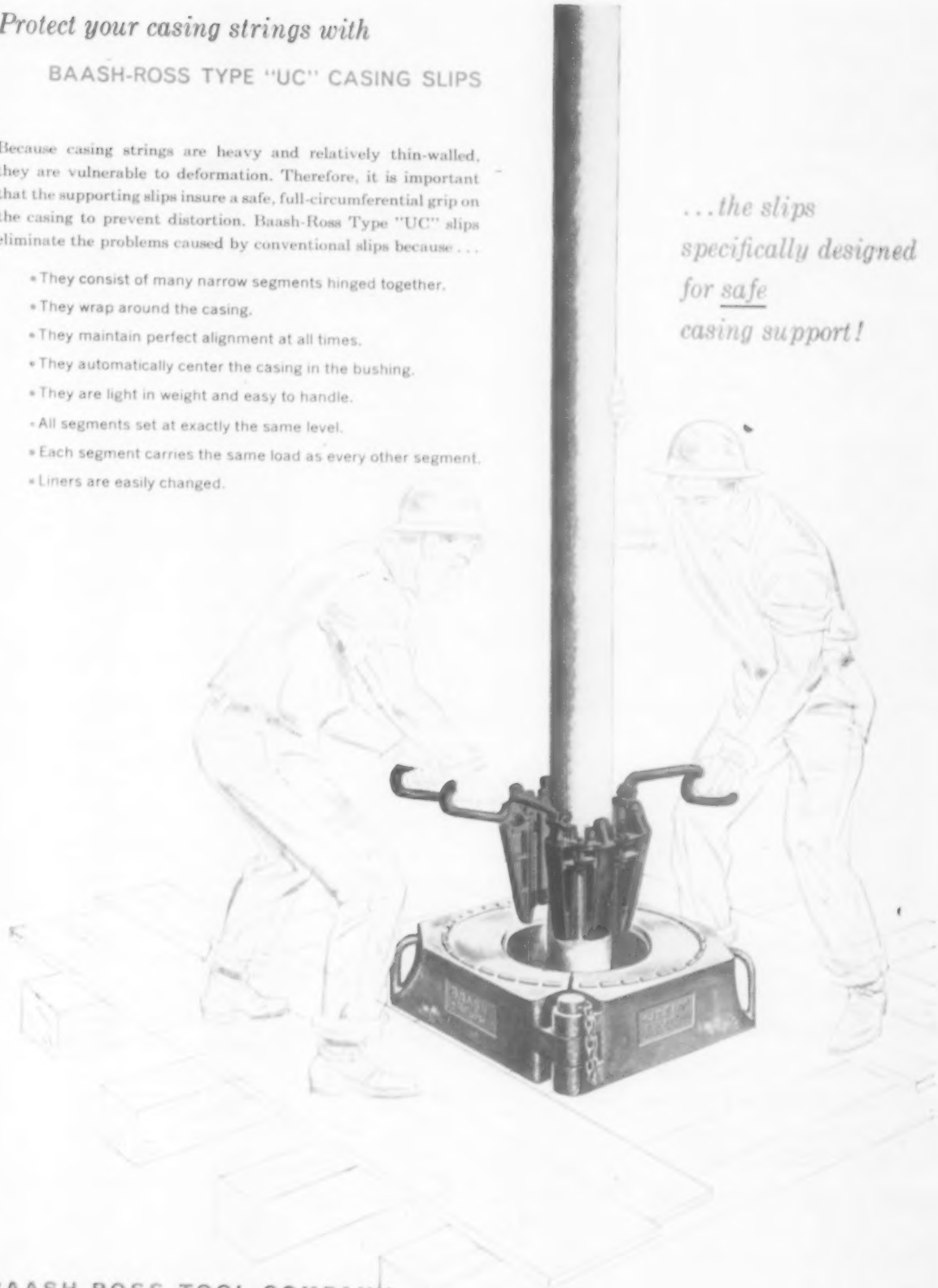

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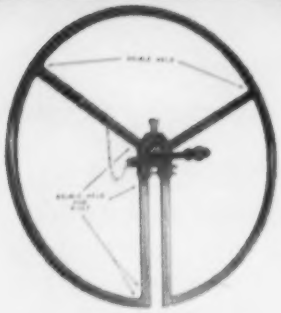

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Coal County Discovery Has High Flow Rate

Anderson-Prichard Oil Corp. 2 Woods, SW NE SW 23-1n-8e, Coal County, southeastern Oklahoma, flowed 31 bbl. of oil per hour after fracture.

The well perforated at 2,016-18, 2,020-28, and 2,043-58 ft. The well flowed 1 bbl. per hour, natural before fracturing was employed.

Pasotex will drill a 6,500-ft. wildcat in SE SE NE 21-1n-8e, Coal County. It will be the 1 Vogel.

Turnpike Field Trip Scheduled for April 13

Several hundred Oklahomans are expected to take a thorough, scientific look at Oklahoma formations on April 13 when a caravan of geologists and amateur rockhounds leave Tulsa on the first Turner Turnpike field trip.

The trip is under the direction of the Oklahoma Geological Survey. Dr. Carl C. Branson, director of the survey and the school of geology at the University of Oklahoma, will conduct the tour with the aid of Malcolm Oakes and Dr. Louise Jordan, both survey geologists.

The trip will begin at the east toll gate in Tulsa. Stops will be made periodically along the road. Persons wishing to make the trip may register at the Mayo Hotel in Tulsa on April 12 and at the east toll gate station on the turnpike the morning of April 13. The registration fee includes a 40-page guide book, buffet luncheon, and social hour in the Oklahoma Club, Oklahoma City. Following the social hour there will be a discussion of the trip by Dr. Branson and Dan A. Busch, consultant; Harry E. Christian, Stanolind Oil & Gas Co.; Lou H. Lukert, The Texas Co.; and Gerald C. Maddox, Carter Oil Co.

The field trip has been arranged and is co-sponsored by the Tulsa and Oklahoma City geological societies.

Laverne Area Expanded In Harper County

Gulf Oil Corp. extended the Laverne area in Harper County at 1 McClung, SE SE NW 23-26n-25w.

The well flowed 3,500 M.c.f. of gas on a drill-stem test of the Hoover sand at 4,159-4-213 ft.

KANSAS

Cherokee Discovery Tested In Edwards County

Aurora Gasoline Co. has indicated production from the Cherokee-Pennsylvanian sand at the 1 Schultz, SE SE NW 21-26s-16w, 1½ miles northwest of Wood pool and 3 miles south of Trousdale, Kan.

The well recovered 3,180 ft. of free oil and 155 M.c.f. of gas on a drill-stem test at 4,479-98 ft.

GULF COAST

TEXAS GULF COAST

Thompson Area Discovery Potentialed in Fort Bend

Fort Bend County's new Thompson area discovery has been potentialed flowing 414 bbl. of 25.6°-gravity oil per day from perforations in the Frio sand at 5,124-32 ft.

The discovery well is Humble Oil & Refining Co. 36 Davis, Robert Peebles Survey, Abstract 67, 2½ miles south of Thompson townsite.

Northwest of the 36 Davis well 933 ft., Humble completed the 37 well for 344 bbl. of 25°-gravity oil per day from perforations at 5,062-82 ft.

Three Wells Completed at Rotherwood Field Area

Three wells have been completed in the Rotherwood area of Harris County. Ray M. Southworth 1 A. Henry et al., flowed 142 bbl. of 38.3°-gravity oil per day on 14/64-in. choke from perforations at 5,873-79 ft.

This 5,956-ft. well is located in the James Cooper Survey, Abstract 189.

The Federal Royalty Co. 3 Alvin D. Wunsche was completed for 52 bbl. of 37.6°-gravity oil per day on 12/64-in. choke in the same survey. Perforations were at 5,883-86 ft. The third new well in the Rotherwood play was Sinclair Oil & Gas Co. 1 K. A. Carter, James Cooper Survey. That well pumped 51 bbl. of 36.3°-gravity oil per day from perforations at 5,851-56 ft.

Marrs McLean Discovery Gaged in Jefferson County

The Marrs McLean area discovery in Jefferson County has been gaged by Clegg and Hunt. The 1 George W. Brown, Sr., et al., 4 miles northeast of Hamshire, Tex., was dually completed in the McLean sand and the Hackberry zone.

The McLean perforations were at 10,406-48 ft. The well made 130,000 M.c.f. of gas per day and some distillate. Gas-liquid ratio was 52,000:1. The Hackberry zone at 10,692-10,726 ft. gaged 140,000 M.c.f. of gas per day with a distillate spray. Gas-liquid ratio was 29,700:1.

SOUTH LOUISIANA

Completion Due at Maurice Discovery Well in Vermilion

Vermilion Parish has a new discovery on the Maurice prospect, 5 miles southeast of the one-well Ridge field. The discovery well is Seaboard Oil Co. 1 Hebert, Jr., in the north central part of the parish.

The well flowed 4,235 M.c.f. of gas per day with 96 bbl. of distillate on 10/64-in. choke from perforations at 11,380-82 and 11,388-94 ft. Seaboard will try completion at a temporarily abandoned well 1 mile west of the discovery at 1 Picard. Total depth last year was 13,175 ft. A possible gas sand was logged at 13,145-75 ft., but no tests were made at that time. The Hebert discovery is located in 41-11s-4e.

Buras Levee Discovery Is Completing in Plaquemines

Stanolind Oil & Gas Co. 1 Buras Levee District, a new gas-distillate discovery area on the West Bastian Bay Prospect, Plaquemines Parish.

The discovery is taking potential after flowing gas-distillate at 14-508-18 ft. There was no gage reported. Other zones in the well tested gas. Gas was tested at 13,927-78, 13,666-70, and 12,572-82 ft. Location is in 14-21s-28e.

Northwest Grand Bay . . . Gulf Refining Co. 2 Grand Prairie Levee District flowed 24 bbl. of distillate and 1,030 M.c.f. of gas on ¼-in. choke from perforations at 9,630-40.

SOUTHWEST TEXAS

Potential Awaited at New Hidalgo Discovery

P. H. Welder has a new Frio sand gas discovery 1 mile south of McCook townsite in Hidalgo County. The 1 W. J. Davis et al., tested perforations at 5,495-99 ft.

The operator is now waiting for potential at the new discovery. Location is in the G. O. Newman Subdivision of the Hidalgo County School Lands, Section 7, Block 2.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Extension to West Beaver Panhandle Field Indicated

Sunray-Mid-Continent Oil Co. has indicated a possible extension to Beaver County's West Beaver Panhandle field.

The 1 Adams, C SE NW 28-5n-23eCM, flowed 4,900 M.c.f. of gas per day on a drill-stem test at 6,371-96 ft.

TEXAS PANHANDLE

Des Moines Discovery Finaled in Ochiltree

The fast-moving pre-Permian play in Ochiltree County added a new producing area. The discovery well, The Texas Co. 1 C. D. Conner, 1 mile south of Farnsworth town and 3½ miles northwest of Farnsworth field, flowed 318 bbl. of oil in 12 hours or at the daily rate of 636 bbl. from perforations in the Des Moines-Pennsylvanian at 6,719-31 and 6,747-51 ft.

SOUTHWEST KANSAS

Viola Discovery Opened New Pay in Region

Pure Oil Co. 1 Parks, a new-pay discovery in new Beals field, east-central Comanche County, flowed gas at the rate of 8,980 M.c.f. per day from Viola lime at 5,656-66 ft.

Location of the discovery is SW SW SE 32-33s-17w.

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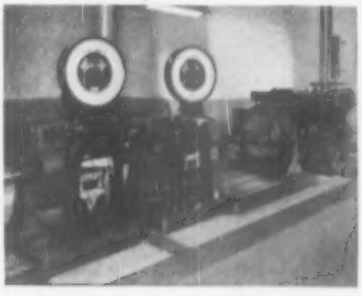

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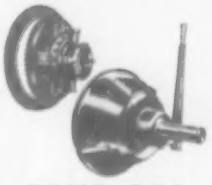

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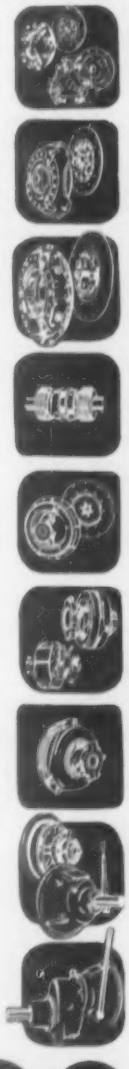

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CLUTCHES

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MONTANA

High Flow Rate Reported At Wolf Springs Well

A Wolf Springs field well flowed at the estimated rate of 600-700 bbl. per day. The well is DeKalb, Northern Oil Division 1 State, C SE NE 24-7n-31e, Yellowstone County.

The well produces from perforations in the Amsden. Top of the Amsden is 6,192 ft. This well is located ¾ mile southwest of production, 45 ft. lower structurally than the field discovery well.

Location has been staked for the 2 State in NW NE 24-7n-31e, the northwest offset to the 1 State well.

Red River Discovery Finaled at Repeat

The Repeat area discovery in Carter County, southwest of the main Cedar Creek anticline trend, was completed last week by Ohio Oil Co. and Texas Pacific Coal & Oil Co.

The 1 Government, C Lot 6, 4-1s-62e, 22 miles west of Buffalo field, South Dakota, flowed 186 bbl. of oil daily on 10/64-in. choke from perforations in the Red River-Ordovician at 8,605-10 ft. Total depth was 9,362 ft. in the Winnipeg.

Location of this important far-southwest Williston basin discovery is 19 miles southeast of Little Beaver field on the south end of the Cedar Creek anticline. This is the first production in Carter County. The confirmation well, 2 Government, C Lot 8, 3-1s-62e, is drilling at 7,950 ft. It is 1 mile east of the discovery well.

UTAH

Entrada Gas Discovery Reported in Grand Area

Grand County in eastern Utah has a new gas discovery. The strike is Sinclair Oil & Gas Co. 2 San Arroyo Unit in SE SE NW 22-16s-25e. The well flowed at the rate of 5,949 M.c.f. per day on drill-stem test at 6,624-40 ft.

The operator made a second test at 6,655-74 ft., getting gas at the rate of 4,465 M.c.f. per day. The well is also a Dakota discovery at 5,860-6,020 ft. A test of that zone rated 1,993 M.c.f. per day.

Location of this well is 1½ miles northwest of the San Arroyo field discovery well which Sinclair completed for 18,500 M.c.f. per day from the Entrada.

NORTHWEST NEW MEXICO

Good Oil Flow Tested At San Juan Discovery

British-American Oil Producing Co. 1 Marya, NE NE NE 1-25n-13w, San Juan County Gallup discovery, flowed 590 bbl. of oil per day on test at 4,838-56 ft.

This discovery is 3 miles northwest of production in Bisti field, a lower Gallup producer. Two other wells are drilling near the discovery.

Successful Wildcats

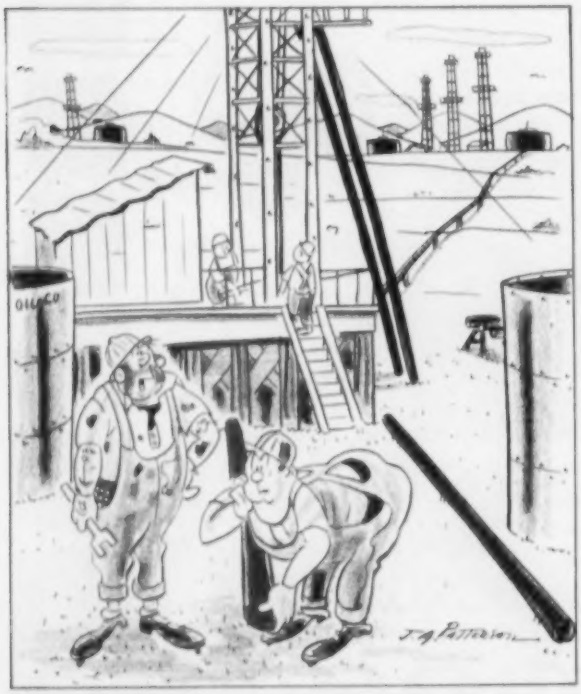
SOUTH LOUISIANA

Acadia Parish: Clayton N. Smith and C. W. Sanders 1-A W. B. Vincent, 26-7s-2w, IP tested small amount of oil and shut in, will be completed later. Perfs. near 2,100 ft. TD 8,771 ft.

Allen Parish: Oberlin Extension discovery, H. L. Hunt 1 A. D. Hill et al. Unit, 35-5s-4w. IPF 194 BDPD, and 1,980 M.c.f. of gas per day, 10/64-in. choke, perfs. 9,870-82 ft. 58.4°. GOR 10,187:1. TD 9,974 ft.

Cameron Parish: New gas-distillate sand at Chenier Perdue field. Lamson, Bennett & Cole J-2 Miami Corp., 11-14s-7w. IP

THE OIL AND GAS JOURNAL



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Plaquemines Parish: New oil sand offshore in West Delta Block 84. Continental Oil Co. 2 State Lease 2551. IPF 426 BOPD, and 35 M.c.f. of gas per day, 10/64-in. choke, 36.2°, perfs. 11,030-42 ft. TD 11,344 ft.

St. Mary Parish: Gas-distillate discovery in Eugene Island Block 27 area. The Texas Co. 1 State Lease 828, OCS 9312 Blk. 27. IPF 61 BDPD, 2,054 M.c.f. of gas per day, 10/64-in. choke, 51.1°, perfs. 10,475-90 ft., GCR 33,518-1. TD 12,165 ft.

MONTANA

Carter County: Ohio Oil Co. et al 1 Government, Lot 6, 4-1s-62e. IPF 186 BOPD, 10/64-in. choke, Red River discovery, new field. TD 9,362 ft. Winnipeg.

NEBRASKA

Banner County: Rite-Way Oil & Investment Co. 1-B Schneider, C SW NW 15-18n-53w. IPP 170 BOPD, "J" sand discovery, new field. TD 5,367 ft. Skull Creek

WEST TEXAS

Andrews County: The Texas Co. 1 State BD, 15-11-ULS Sur., 24 miles NW Goldsmith. IP 137 BOPD, 22/64-in., TP 650 psi., GOR 5465, 31°, San Andres 4,338-80 ft. TD 9,075 ft., PB 4,427 ft.

Gaines County: C. C. Winn 1 Hudson, 60-AX-USL Sur., 6 miles SW Denver City. IP 122 BOPD, 32°, GOR 1375, Glorieta 4,934-66 ft. TD 8,086 ft., PB 6,210 ft.

Runnels County: Ada Oil Co. 1 Hollingsworth, Sec. 24, T. M. Fowler Sur. 440, 3 miles E Norton. IP 190 BOPD, 15/64-in., TP 600 psi., GOR 1894, 42°, Gardner sand 4,538-44 ft. TD 4,807 ft. Suggested name, East Norton.

Ada Oil 1 Mills, Blk. 4, H&TC Sur., 4 miles NE Winters. IPP 87 BOPD, 42°, GOR 750, Gardner 4,300-15 ft. TD 4,662 ft. Suggested name, Briley-Gardner limestone.

Sunray Mid-Continent Oil Co. 1 Rives, Sec. 318, F. J. Ford Sur., 5 miles NE Winters. IPP 65 BOPD, 45°, GOR 737, Gardner sand 4,375-80 ft. TD 4,675 ft.

Winkler County: Shell Oil Co. and Phillips Petroleum Co. 1 McCabe, 36-B5-PSL Sur., 3 miles NE Wink. IP calculated open flow 102,000 M.c.f. gas, plus 55 bbl. condensate per 1,000 M.c.f. Devonian perforations 9,150-9,340 ft. TD 11,623 ft.

SOUTHEAST NEW MEXICO

Lea County: Cabot Carbon Co. 1 Fleet, 35-13s-37e. IP 1,000 BOPD, 20/64-in., TP 750 psi., GOR 2000, 46.5°, Devonian 12,439-54, 12,476-91, 12,506-13 ft. TD 12,839 ft., elev. 3,854 ft.

NORTH TEXAS

Montague County: McLean & Bruner 1 Pippin, Sec. 163, Belcher Subd., J. Smith Sur., A-687, 5 miles S Belcherville. IPP 60 BOPD, 42°, GOR 420, conglomerate 6,001-03 ft. TD 6,289 ft.

WEST CENTRAL TEXAS

Fisher County: General Crude Oil Co. 1 Simpson, Subd. 22, Bastrop CSL 313, 4 miles NE Roby. IP 106 BOPD, ¼-in., TP 675 psi., GOR 5117, 41°, Canyon sand 4,863-71 ft. TD 6,252 ft.

Payne-Johnson 1 Burnett, 8-3-H&TC, 16 miles NW Roby. IPP 25 BOPD, 40°, GOR 142, Ellenburger 7,075-83 ft. TD 7,102 ft., elev. 2,139 ft.

Haskell County: Thomas D. Humphrey & Sons 1 Irvin, Red River CSL Sur. 75, 2 miles SE Rochester. IP 133 BOPD, 16/64-in., TP 160 psi., GOR 265, 39°, Strawn 5,809-16 ft. TD 5,828 ft.

Taylor County: Miami Operating Co. 1 Herber, J. M. Moores Sur. 31, 1½ miles S Moro. IP 124.8 BOPD, 24/64-in., GOR 1750, TP 860 psi., 44°, Gray sand 4,868-72 ft. TD 5,009 ft.

Throckmorton County: Ard Drilling Co. 1-A Davis, Sec. 94, BBB&C Sur., 11 miles W Throckmorton. IP 127.5 BOPD, 13/64-in., TP 325 psi., 41°, GOR 710 Bend conglomerate 5,135-45 ft. TD 5,248 ft. New field name, Box Springs-Bend Conglomerate.

WEST VIRGINIA

Randolph County, Dry Fork district: Hope Natural Gas Co., 9957 U.S.A. Department of the Interior, elevation 3,178 ft., 7,925,000 cu. ft., gas after fracture, chert 5,069 ft., Oriskany sand 5,216-5,402 ft., gas 5,397-5,401 ft., rock pressure 2,005 psi. in 24 hours. TD 5,408 ft.

SOUTHWEST TEXAS

District 4

Brooks County: Mills Bennett Est. 23 Mills Bennett Est. Fee, Palo Blanco Ysidoro Guerra Grant A-258. IPF 126 BOPD. Top pay 4,843 ft. Segment 2, 47°, perfs. 4,886-95 ft., GOR 590:1. TD 6,240 ft. (New pay in Mills Bennett field.)

San Patricio County: Ginther, Warren & Ginther 1 Alvin B. McNair et al., W. R. Ray Sur. A-337. IPF 6,500 M.c.g. of gas per day, open, 52°, GOR 7 BD per million. perfs. 4,716-22 ft. top pay 4,716 ft. Vicksburg-Stray. TD 4,878 ft. (New pay at East Mathis. Well shut in).

Zapata County: Miller & Pierce 1 Anastacio Garcia II, Anatolio Vela Grant. Sec. 434. IPP 40 BOPD, top pay 1,426 ft. 21.5°, perfs. 1,423-40 ft. TD 1,511 ft. (Discovery of Miller & Pierce field).

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Buying Drill Collars through your supply store makes good sense

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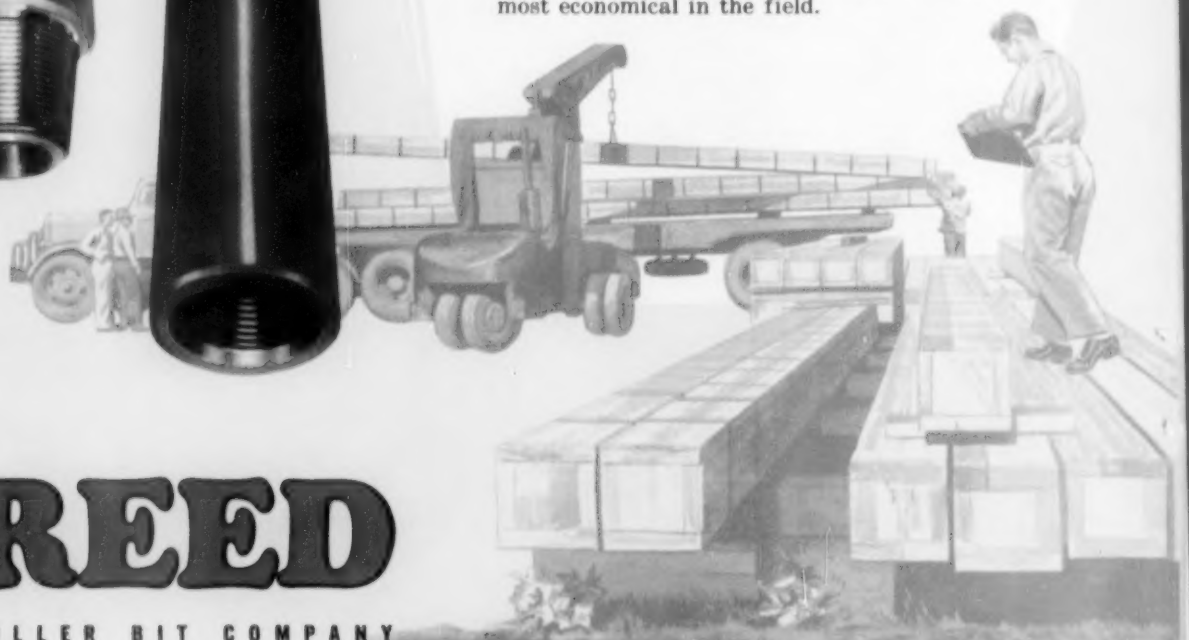

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ROLLER BIT COMPANY

HOUSTON 1, TEXAS

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products.

Write for Bulletin DC55B. This bulletin will give you specifications, dimensions, weights, torque tables and other drill collar use data. The book also contains pointers on care and maintenance.

Tide Water picks Roth as . . .

. . . New Production Coordinator

TIDE WATER ASSOCIATED OIL CO. has joined the parade of major companies which are adding production coordinators to their top management staffs.

The man Tide Water has chosen for this job is J. E. Roth, vice president and general manager of the company's central division headquartered in Tulsa.

He has moved to San Francisco to assume the duties of administrative vice president for production. It will be his responsibility to plan and coordinate the producing activities which now are netting the company more than 90,000 bbl. of crude daily.

Producing properties are scattered throughout the United States and in Canada. They will be extended to Turkey if the company's new exploration venture there pays off, and perhaps to other foreign countries in which Tide Water is interested.

Production experience . . . Although the job is new, there can't be too much of it that is strange to Roth.

He has been coping with problems of production for Tide Water ever since he was graduated from Cornell with a mechanical engineering degree 32 years ago. Since 1954 he has been bossing the far-flung central division which embraces territory from Texas to Saskatchewan.

This new phase of Roth's career points up the increasing complexity of the oil business and how it has changed since he started roustabouting for Tide Water (then Tidal Oil Co.) in 1924.

Then, under the law of capture, his job was to get the most oil out of a well in the least possible time before the next operator beat him to it.

During the Seminole boom of the late 20's, Roth saw this system in its heyday. It was his job to build flow plants to get a few more months of flush production out of a well. Compressed air was forced down the tubing to prolong its flowing life. It mattered not that the reservoir pressure was depleted with most of the oil still in the ground.

Now, under the laws of conservation and correlative rights, Roth faces far different problems as No. 1 production man for a big company. Rather than every man for himself, cooperation is essential to success.

An important part of his job, as Roth sees it, is working together to formulate plans that are mutually agreeable to partners and other field operators. In an era of joint operations, such as the C.A.T.C. offshore group in which Tide Water participates with three other companies, this is particularly true.

Background . . . John Edward Roth was born August 28, 1901, in Detroit. He received an A.B. degree from Cornell in 1923 and added an M.E. a year later.

He was married to Laura Hoyt in 1925. This was a year after starting a career in Tide Water's Tulsa office that has continued unbroken until this promotion that will take him to California.

He climbed steadily from roustabout to petroleum engineer, to chief engineer, then vice president in charge of production for the Mid-Continent area in 1949, a position he held for 5 years before taking over the expanded central division.

To the delicate and demanding task as coordinator of production, he will bring tact and a winning personal manner as wells a solid background of experience at all levels of company operation.

Roth likes to relax on the golf course or by matching wits with mountain trout. This latter hobby has been slighted for the past 2 years, a situation which Roth hopes to correct when he gets settled in the new job.

The Roths have two daughters, Marian (Mrs. W. J. Bovaird) and Elizabeth.

He is a director of the A.P.I., the Mid-Continent Oil and Gas Association, and the Tulsa Y.M.C.A. He is a member of Sigma Chi, the Tulsa Club, and Southern Hills Country Club.

Gene Caperton will resign May 1 as vice president of the Casper National Bank, Casper, Wyo., to become a consultant there.

John Lawrence, formerly with Gulf Oil Corp. in Denver, has been named to head a new Tulsa office for Scott, Scott & Sheppard, Denver producers. **Carl Everett** will head a new office for the firm in Farmington, N. M.

R. C. Kettenburg, Richfield Oil Corp. mechanical engineer, has been transferred from Bakersfield, to Long Beach, Calif.

Frederick L. Stead has resigned as western division exploration manager for Ada Oil Co. in Midland, Tex., to join McAlester Fuel Co., Magnolia, Ark., as chief geologist. Stead opened Ada's Midland office 2 years ago. Earlier he was district geologist there for Continental Oil Co.

David H. Rankin, Fort Worth consultant and independent operator, has formed his own firm to deal in oil, gas, and associated securities. The firm, to be known as David H. Rankin & Co., is a member of the National Association of Securities Dealers.

Robert B. Rice, formerly with Phillips Petroleum Co.'s research staff in Bartlesville, Okla., has been named senior research physicist in Ohio Oil Co.'s new research center nearing completion near Denver.

Frederick S. Lott, on the staff of the Interior Department's Office of Oil and Gas since 1951, has been named assistant director. He will coordinate development and planning to insure a worldwide supply-demand balance for oil, natural gas, and products. He'll also supervise the Foreign Petroleum Supply Committee, and will be a U. S. representative on NATO's petroleum planning committee. Before joining Interior's Oil and Gas Division, Lott spent 14 years with the Bureau of Mines.

Personals

Joe Braig, a veteran of 25 years' Rocky Mountain area drilling, has been named drilling superintendent of Red Willow Drilling Co., Ltd., Edmonton.

R. W. Cochrane, assistant to the president of British American Oil Co. since 1952, has been promoted to manager and coordinator of transportation.

Charles H. Dobbs has been transferred by Cities Service Oil Co. from Oklahoma City to Olney, Ill., where he will be district geologist for Illinois and Michigan. He replaces **V. J. Quick,** transferred to Great Bend, Kans.

Don E. Hageman, Billings, Mont., has been re-elected chairman of Montana's Oil and Gas Conservation Commission for 1 year. **J. H. Frerich,** Poplar, Mont., was re-elected vice chairman.

R. S. Nabors has been promoted by Pacific Gas & Electric Co. from northern division superintendent to superintendent of transmission and compression. He succeeds **Fred Wilson,** retiring in July. **Harry Prudhomme** takes Nabors' post.

Dr. Robert L. Slobod has resigned as supervisor of reservoir mechanics in Atlantic Refining Co.'s research and development division, Dallas, to become head of the petroleum and natural gas department at Pennsylvania State University. He also will be professor of petroleum and natural gas engineering. Slobod will take the new post May 1.

F. H. Clements has been promoted from production foreman to field superintendent in Stanolind Oil & Gas Co.'s Yates area, Iraan, Tex. He replaces **E. J. Harmon,** who is retiring. Clements joined Stanolind in 1946 as a roustabout. He later served as junior engineer in Andrews, Tex., petroleum engineer in Midland, Tex., and senior petroleum engineer in Tulsa and Fort Worth.

James N. Fuquay has been promoted by Sun Pipe Line Co. from area superintendent in Corpus Christi to assistant chief engineer, crude lines department, Beaumont. **Jesse D. Duplissey,** former assistant superintendent in the Beaumont office, succeeds Fuquay. **Charles W. Gibson** moves up from district foreman in Snyder, Tex., to replace Duplissey. **Rupert Short,** who has been district foreman in Seabreeze, Tex., takes Gibson's post.

C. T. Stout last week was elected a vice president of Blackwell Oil & Gas Co. He has been with the company since 1923 and a director since 1951. He succeeds **A. B. Imel,** who is retiring as a vice president but who will remain as a director and a consultant to Blackwell. Stout is in charge of the company's land department.

Jay H. Forrester, research manager of Stanolind Oil Co. (Ind.), will be president of a new chemical company to be formed the end of this year when

J. H. FORESTER

DR. P. C. WHITE

three Standard chemical subsidiaries are consolidated. **Dr. Philip C. White,** manager of research and development for American Oil Co. in Texas City, Tex., will succeed Forrester. **Joseph K. Roberts,** Indiana Standard director and general manager of research and development, will oversee the firm's petrochemical activities. The new chemical firm, not yet named, will be headquartered in Chicago. Forrester joined Indiana Standard's research staff at Whiting in 1929 and was named director of technical service there in 1940. He was transferred to Stanolind Oil & Gas Co.'s manufacturing department in 1946 and later became manager of its central division. He returned to the parent firm in 1952. White entered Indiana Standard research in 1938 and later rose to division director. He has been with American since 1951.

Adrian W. Silenzi has been advanced from assistant general manager to general manager of Esso Colombia, S. A. Other changes at International Petroleum Co., Ltd.'s Colombian subsidiary include: **D. C. Brooks,** from supply and transportation manager to operations manager; and **F. J. Dostaler,** from river transportation supervisor to succeed Brooks.

Harry F. Allen has been transferred by Carter Oil Co. from northern division engineer in Billings, Mont., to the production staff in Tulsa as special projects engineer. Other Carter changes: **George Link,** engineer, from Mattoon, Ill., to succeed Allen in Billings; **J. D. Simmons,** from St. Elmo, Ill., to take Link's Mattoon post; and **Joe E. Norman,** from Magnolia, Ark., to district engineer in St. Elmo.

A. H. Weyland, board chairman of Arkansas Louisiana Gas Co., has become a consultant to Arkansas Fuel Oil Co., Shreveport.

Hugh E. Hanagan has resigned as geologist for Phillips Petroleum Co. in Bartlesville, Okla., to join Kewanee Oil Co. in Midland, Tex.

Robert A. Harris has resigned from the staff of Ralph E. Davis, consultant, to join Starr Oil & Gas Co., Houston, as geological manager.

Melvin L. Tate, tool pusher for Parker Drilling Co., Tulsa, in West Texas, New Mexico, and Oklahoma, has been named drilling superintendent in charge of Israel operations for Parker. Tate joined the company as a roughneck in 1947.

J. H. Menhall, Benton, Ill., independent, has been granted exploration concessions by the Syrian Government, and has formed Menhall Exploration Co. to handle operations. Financing is being negotiated with Portsmouth Steel Corp., Cleveland.

A. L. Porter has been named acting executive director of New Mexico's Oil Conservation Commission, Santa Fe, replacing **William B. Macey,** who resigned. Porter has been proration manager and district supervisor of the commission's Hobb's office. He joined the commission in 1950 and was instrumental in setting up its proration system. **Randall F. Montgomery** replaces Porter at Hobbs.

James V. Neuman, Jr., vice president of U. S. Smelting, Mining & Refining Co., has been named to manager of the firm's oil operations in Midland, Tex. Neuman was manager of the oil department's southern division in Midland. That division and a similar one in Billings, Mont., have been deactivated. **W. F. Walthall** will remain in Billings to manage an office there. **George S. Anderson** will manage the Denver office.

M. D. Mauck has been promoted from division geologist to division exploration manager of Pure Oil Co.'s Texas producing division, Fort Worth. **J. W. Luckett, Jr.,** moves up from district geologist in Midland, Tex., to succeed Mauck. Other Pure changes: **R. K. Bradley** moves from Roswell, N. M., to Midland to replace Luckett; **E. S. Dietrich,** former geological coordinator in Fort Worth, replaces Bradley; **V. S. Balderson,** former geophysical staffer in Fort Worth, takes Dietrich's post; and **R. M. Neill, Jr.,** staff geologist, moves from Tyler, Tex., to Midland.

Denver Petroleum Club Elects Stalcup

Obie L. Stalcup, regional manager of Halliburton Oil Well Cementing Co., has been elected president of the Denver Petroleum Club. The new officers are, left to right: Stalcup; E. A. (Tip) Polumbus, Denver consultant, first vice president; Wayne Glenn, Continental Oil Co., second vice president; and Clarence L. Bainter, Denver division tubular manager for National Supply Co., secretary-treasurer.

D. H. Sholtus, Great Lakes Carbon Corp. district production superintendent, has been transferred from Wichita to Tulsa.

Perry G. Holloway has resigned from Skelly Oil Co. to become chief geologist for McCord Oil Co., newly formed to operate in Arkansas, Louisiana, and Texas.

A. C. Atkins has resigned as petroleum engineer for Humble Oil & Refining Co. in Midland, Tex., to become an independent. He's now part owner of the George Atkins estate, Fort Stockton, Tex.

Dudley Beyler, recently commercial development engineer in Houdry Process Corp.'s Linwood, Pa., research and development laboratories, has been named products sales engineer in the chemicals division. Beyler joined Houdry in 1951 as process development engineer.

John C. Maher has been named Mid-Continent regional supervisor for the U. S. Geological Survey's fuels division, effective July 1. He will headquarter in Denver. Maher has been head of the division's Central Mid-Continent investigations in Tulsa for 12 years. He's an active member of the American Association of Petroleum Geologists, and served 8 years as associate editor of the group's Bulletin. **Ernest E. Glick** succeeds Maher in Tulsa.

Fred W. Fairman, Jr., Chicago investment banker, has been elected a director of Tekoil Corp.

Donald L. Berry has been promoted by Phillips Petroleum Co. from geophysical interpreter in Pratt, Kans., to party chief in Larned, Kans.

Angus MacNeill, superintendent of Pembina operations for Mobil Oil of Canada, Ltd., since 1953, has been promoted to drilling superintendent for all Canadian operations. MacNeill entered the industry in 1927 as a tool pusher in Turner Valley field, Alberta.

Personals

Thomas R. Shugart has resigned as president of Research, Inc., Dallas, to organize a new exploration consulting firm there.

Max F. Powell, former senior engineer for the Texas Railroad Commission, has opened consulting offices in Austin.

John R. Miller, consultant, and **Johnny W. Mullinnix,** former landman with Skelly Oil Co. in Casper, have formed a partnership for geological consulting and oil leasing. They'll be headquartered in Casper, Wyo.

Martin Mears, former drilling superintendent for Tide Water Oil Co. in Ventura, Calif., has been promoted to the staff of F. W. Hertel, western division manager.

David W. Ratliff, Stanolind Oil & Gas Co. district geophysicist, has been transferred from Oklahoma City to Houston. He also will supervise seismic work in the San Antonio and Corpus Christi districts.

H. W. Brown, Humble Oil & Refining Co. petroleum engineer, has been transferred from the Anahuac district to the Katy gas cycling plant, Gulf Coast division. Other Humble changes: **J. A. Reed II,** petroleum engineer, from the Katy plant to the gas-engineering division, Houston; **J. R. Boswell,** civil engineer, from the Conroe district to the Gulf Coast division office, Houston; and **J. P. Sutton,** junior petroleum engineer, from the London district, East Texas division, to the Hobbs district, Western division.

DEATHS

Robert H. Wood, 69, widely known geologist and president of Broswood Oil Co., Tulsa, died there April 3. Wood joined the U. S. Geological Survey in 1911 after spurning a fellowship in geology at Yale University. In 1919 he moved to Tulsa to open a consulting partnership with a brother, the late Virgil O. Wood. The two brothers formed Broswood in 1925. He was an organizer and the first treasurer of Tulsa's Petroleum Club.

Eugene T. Singer, 69, Green Pond, N. J., retired vice president and director of Standard-Vacuum Oil Co., died March 27 in St. Petersburg, Fla. He retired in 1949 after 37 years with the industry.

Walter G. Tschudin, 64, one of the owners of Pioneer Drilling Co., Casper, Wyo., died there March 31. A former official of Sinclair Oil Corp., Tschudin joined with Jack Burden to form the drilling firm in 1945.

Jim Flowers, 75, well known as an independent operator in Texas and North Dakota, died March 26 in Dallas.

Daniel B. Lesh, Jr., managing partner of D. B. Lesh Drilling Co., Mattoon, Ill., was killed March 16 in an auto accident near Casey, Ill.

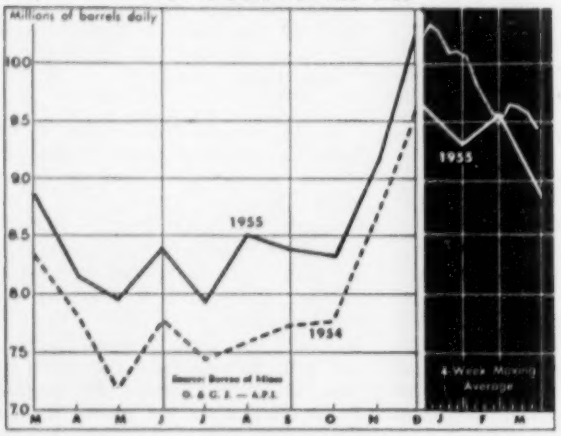
John E. Morrow, Pittsburgh independent and pioneer driller, died recently in Pittsburgh.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,169,360	DOWN	6,900	UP	294,620
Crude stocks	260,037,000	UP	3,371	UP	107,000
Completions	1,006	UP	19	DOWN	128
Refinery runs	7,694,000	DOWN	276,000	UP	488,000
Gasoline stocks	198,209,000	UP	1,408,000	UP	12,927,000
Kerosine stocks	17,333,000	DOWN	377,000	DOWN	1,287,000
Distillate stocks	62,583,000	DOWN	3,329,000	UP	733,000
Residual stocks	33,896,000	DOWN	151,000	DOWN	10,738,000
Four-product stocks	312,021,000	DOWN	2,449,000	UP	1,635,000
Total imports	1,176,700	DOWN	239,500	UP	66,600

TOTAL DEMAND—ALL OILS



Pipeline and River Competition for Inland Gasoline Market Gets Hotter

COMPETITION from river gasoline still is creating soft spots in areas normally served by Group 3 refiners. At this time last year, Mid-Continent refiners were moving regular gasoline on the spot market at 10.25 cents a gallon. But by the end of April 1955 the low of the spot market had moved up to 10.75 cents. About the middle of July, the price increased to 11.00 cents which held until about 2 weeks ago.

A prime limiting factor in last year's recovery was both direct and exchange competition from gasoline moving from District 3 to District 2 on the Mississippi River. This same competition now has halted the firming trend on the Group 3 market that started soon after the middle of last month.

Regular gasoline made on the Gulf Coast or at Inland Texas refineries in competition with Gulf Coast material carries a normal Gulf Coast cargo price of 10.5 cents a gallon for 87-octane material. The quality is slightly above pipeline specifications for Group 3 gasoline for northern movement. Also, the price is 0.75 cent a gallon under the recent Group 3 low for regular, compared with a spread of 0.5 cent before the mid-March firming of the Group 3 market.

The broader spread tends to increase the marketing territory around river terminals, but the influence of exchange agreements is an even greater factor in area competition. If the supplier who trades gasoline on the river for material in the Great Lakes line is a marketer on the pipeline, the gasoline will move through normal distribution channels. On the other hand, if the gasoline on the pipeline is to be sold on the spot market, it may take severe price cuts to move the material.

There have been unconfirmed reports within the past week of some regular gasoline moving at a price well under the Group 3 low. The influence on the market will be determined by the amount of gasoline available for sale at the low price.

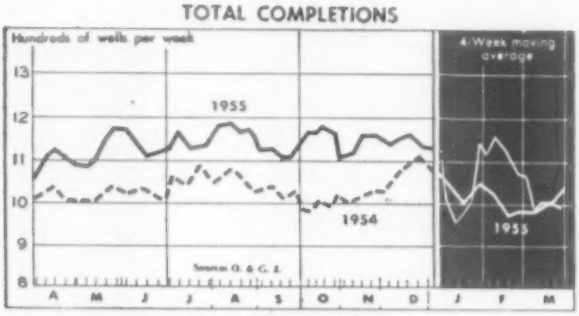
Direct competition between gasoline on the river and that made by Mid-Continent refiners will undergo further adjustments when the higher-octane gasolines are available at pipeline terminals.

Premium gasoline going into the Great Lakes line now has an octane number of 96, and regular grade will be raised to 88 octane on April 16. To compete with this improved fuel, Gulf Coast refiners will have to boost the lower grade regular, now averaging about 87 octane, or ship 90-octane regular up the river. The market struggle will be renewed when Mid-Continent refiners raise prices to cover some of the increased production costs.

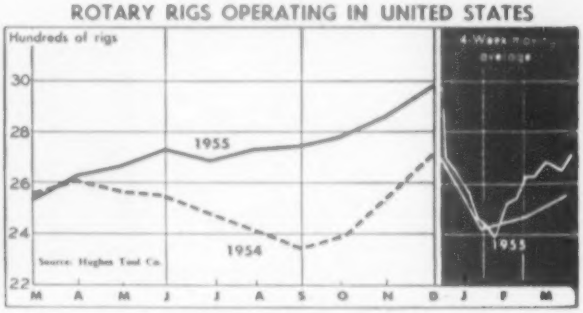
Gulf Coast distillates soften . . . The Gulf Coast low for No. 2 distillate now is 8.75 cents a gallon for cargo movement, down 0.25 cent. Total distillate stocks are not out of line, but there has been some buildup on the Gulf Coast. Distillate stocks for the country as a whole are about the same as last year, but Gulf Coast stocks are up 2,700,000 bbl. East Coast stocks are down about 2,400,000 bbl.

Total residual stocks are at the lowest level since 1946, but Group 3 quotations are off about 5 cents a barrel. The general shortage should prevent any big break in the market.

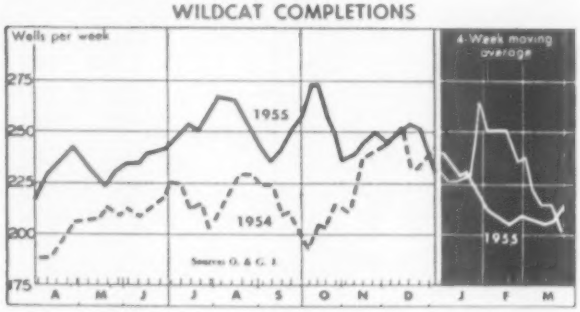
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-2-56	Change from 3-26-56	Change from 4-4-55
Gulf Coast	650	—16	84
N. and W. Texas-E. Texas	950	27	94
Arkansas-N. Louisiana-E. Texas	158	—2	—13
Oklahoma	336	23	—6
Kansas-S. Nebraska	176	—4	—10
Illinois-Eastern	114	29	11
Rocky Mountain	200	8	—13
Pacific Coast	128	4	—29
Total United States	2,712	69	118
Western Canada	148	—42	—9

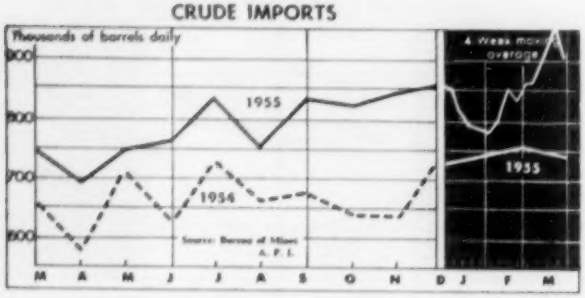
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 31, 1956

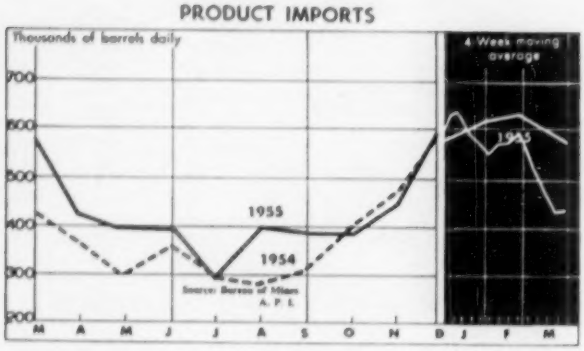
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1956	Cum. 1955	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1956: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	1	0	1	17,899	24	30	0	0	0	1	1	0	0	1	13	14
Arkansas	12	10	0	2	34,092	187	141	1	0	0	0	1	10	0	2	28	40
California	37	27	1	9	147,148	515	615	0	0	0	8	8	10	0	0	99	109
Colorado	5	0	0	5	38,410	266	294	0	0	0	5	5	4	0	3	125	132
Illinois	64	26	1	37	144,408	828	886	0	0	0	17	17	11	0	0	129	140
Indiana	10	1	0	9	14,950	157	189	0	0	0	2	2	4	0	1	32	37
Kansas	100	46	9	45	345,181	1,211	1,271	1	0	1	19	21	24	1	9	208	242
Kentucky	29	11	6	12	40,988	418	307	0	0	0	3	3	9	0	0	97	106
Louisiana	68	46	5	17	517,047	967	964	2	3	2	5	12	29	17	8	122	176
North	27	20	0	7	111,328	356	498	0	0	0	1	1	7	0	0	40	47
South	30	17	4	†9	288,722	487	466	1	2	1	4	8	20	15	5	71	111
Offshore	11	9	1	1	116,997	124		1	1	1	0	3	2	2	3	11	18
Michigan	8	4	0	4	21,959	127	134	0	0	0	4	4	3	0	0	41	44
Mississippi	7	1	0	6	38,031	106	118	0	0	0	2	2	4	0	1	41	46
Montana	1	1	0	0	7,000	91	85	0	0	0	0	0	5	0	0	22	27
Nebraska	3	0	0	3	15,610	211	135	0	0	0	3	3	10	0	0	100	110
New Mexico	22	18	3	1	121,746	441	298	1	0	0	0	1	9	0	5	40	54
Northwest	3	0	3	0	20,280	147	75	0	0	0	0	0	0	0	5	13	18
Southeast	19	18	0	1	101,466	294	223	1	0	0	0	1	9	0	0	27	36
North Dakota	0	0	0	0	0	50	45	0	0	0	0	0	2	0	0	12	14
Ohio	36	23	4	†9	99,608	277	267	0	0	0	0	0	1	0	0	2	3
Oklahoma	179	93	11	§75	607,582	2,184	2,007	2	0	2	17	21	40	8	7	180	235
Pennsylvania-New York	4	1	3	0	10,693	209	233	0	0	0	0	0	0	0	1	2	3
Texas	407	260	9	138	1,727,160	5,255	4,715	18	2	1	84	105	210	19	47	1,157	1,433
Southwest (1 & 4)	46	31	1	14	182,542	781	748	2	1	0	12	15	42	5	17	238	302
Gulf Coast (2 & 3)	46	20	6	20	301,007	663	626	3	0	1	15	19	18	8	17	177	220
East (5 & 6)	30	11	1	18	143,383	287	260	0	0	0	13	13	2	1	4	108	115
North Central (7-B & 9)	166	97	0	69	515,250	1,807	1,663	6	0	0	32	38	90	0	1	431	522
West (7-C & 8)	102	90	0	12	506,387	1,422	1,167	7	0	0	9	16	57	0	6	186	249
Panhandle (10)	17	11	1	5	78,591	295	251	0	1	0	3	4	1	5	2	17	25
Utah	0	0	0	0	0	19	11	0	0	0	0	0	1	0	0	15	16
West Virginia	10	1	9	0	29,488	177	150	0	0	1	0	1	0	0	2	3	5
Wyoming	2	1	0	1	9,510	181	200	0	0	0	0	0	4	0	4	57	65
Miscellaneous	0	0	0	0	0	49	6	0	0	0	0	0	4	0	0	36	40
Total United States	1,006	571	61	374	3,988,510*	13,950*	13,103	25	5	7	170	207	394	45	91	2,561*	3,091
Total previous week	987	603	58	326	4,018,211			39	1	5	160	205	390	34	84	2,354	2,862
Total April 2, 1955	1,134	650	54	430	4,457,420			29	4	4	187	224	370	47	84	2,276	2,777
Cumulative 1956	¶13,950	7,654	885	5,411	57,139,131												
Western Canada	63	31	2	30	301,926	581											

Service wells included: †1, ‡2, §16. *Revised. ¶Tentative (see April 23 issue, Monthly Summary).

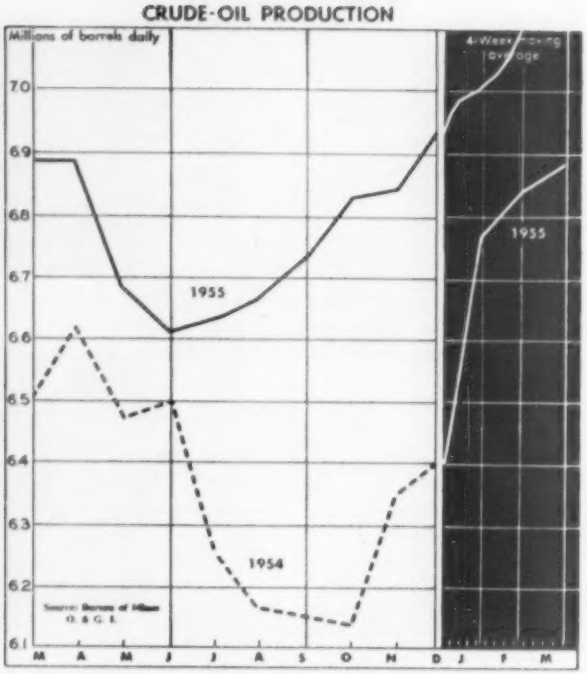
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

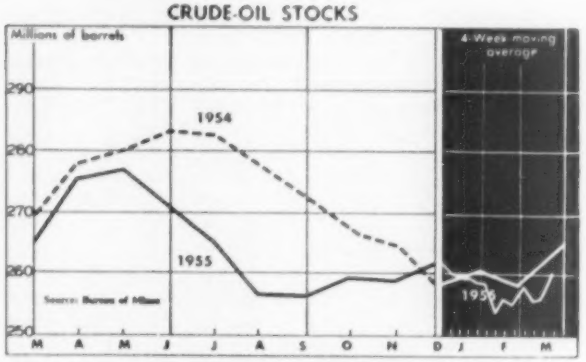


DAILY AVERAGE PRODUCTION FOR WEEK

	March 31			Mar. 24
	Crude oil	Lease condensate	Total	total
Alabama	4,800		4,800	4,900
Arkansas	71,900	500	72,400	74,850
California	965,600		965,600	967,100
Colorado	162,200		162,200	160,800
Eastern	49,100		49,100	48,000
Florida	1,400		1,400	1,400
Illinois	232,000		232,000	232,500
Indiana	32,700		32,700	31,600
Kansas	345,600		345,600	346,400
Kentucky	47,400		47,400	47,800
Louisiana	748,050	72,250	820,300	822,150
North	118,050	2,250	120,300	122,150
South	630,000	70,000	700,000	700,000
Michigan	29,300		29,300	30,300
Mississippi	106,100	4,700	110,800	110,800
Montana	52,400		52,400	50,700
Nebraska	29,500		29,500	29,000
New Mexico	242,125	3,175	245,300	245,100
North Dakota	38,400		38,400	35,800
Oklahoma	615,700		615,700	621,800
Texas	2,974,500	53,900	3,028,400	3,028,400
Dist. 1	54,000	550	54,550	54,550
Dist. 2	151,000	8,450	159,450	159,450
Dist. 3	431,000	25,300	456,300	456,300
Dist. 4	247,000	5,400	252,400	252,400
Dist. 5	47,000	500	47,500	47,500
Dist. 6	130,000	6,200	136,200	136,200
East Texas field	220,500		220,500	220,500
Dist. 7-B	163,000	50	163,050	163,050
Dist. 7-C	177,000	4,700	181,700	181,700
Dist. 8	1,050,000	1,950	1,051,950	1,051,950
Dist. 9	210,000	600	210,600	210,600
Dist. 10	94,000	200	94,200	94,200
Utah	4,900		4,900	5,000
Wyoming	280,800		280,800	281,600
Others	†350	§10	360	260
Total U. S.	7,034,825	134,535	7,169,360	7,176,260
Change from previous week, down			6,900	
Canada	†	†		485,100
Total U. S. production January 1-March 31				646,245,530 bbl.
Same period last year (crude plus cond.)				*614,310,240 bbl.

*Includes 10,399,050 condensate. †Week ended previous Monday. ‡S.D. 100, Nev. 250. §Arizona.

CRUDE-OIL STOCKS



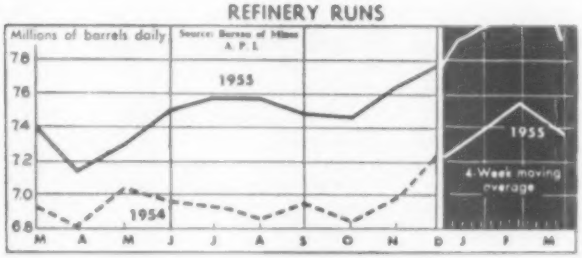
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

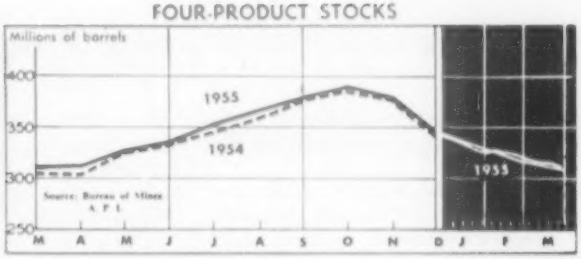
	3-24-56	3-17-56	31-26-55
Pennsylvania Grade	2,683	2,738	2,821
Other Appalachian	2,108	2,138	1,903
Illinois, Indiana, Michigan	9,604	9,264	11,471
Nebraska, North Dakota	2,079	2,186	1,869
Kansas	7,646	7,264	8,387
Oklahoma	23,506	23,325	23,530
Arkansas	2,702	2,646	3,003
Louisiana	15,984	15,415	14,604
North	2,583	2,396	2,336
South	13,401	13,019	12,268
Mississippi	3,101	2,902	3,137
New Mexico	7,608	7,539	8,546
Texas	121,615	121,803	117,727
East Texas proper	9,279	8,896	10,330
West Texas	59,668	60,217	51,649
Texas Gulf	21,900	22,878	23,920
Other Texas	30,768	29,812	31,828
Wyoming	15,884	15,707	13,996
Other Rocky Mountain	5,448	5,267	5,378
California	28,189	26,800	32,004
Foreign	†11,880	11,672	11,554
Total	260,037	256,666	259,930

*Bureau of Mines. †Includes 1,188,000 bbl. in California.

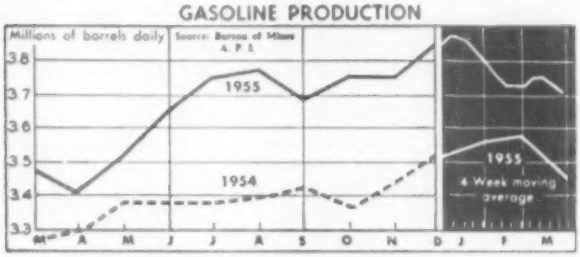
REFINERY RUNS



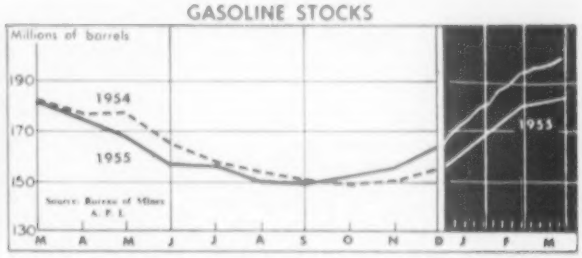
FOUR-PRODUCT STOCKS



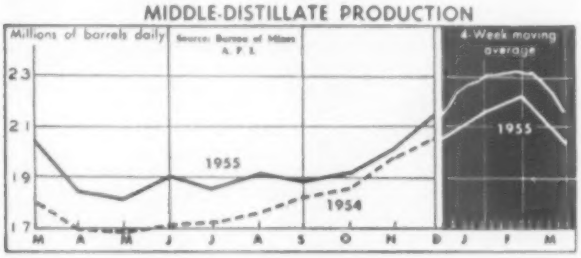
GASOLINE PRODUCTION



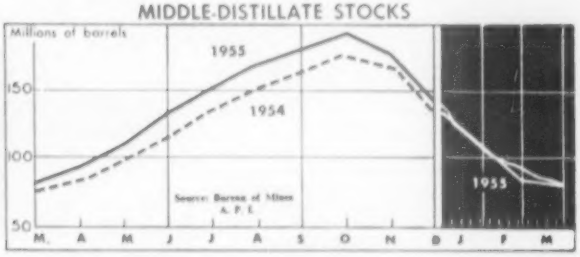
GASOLINE STOCKS



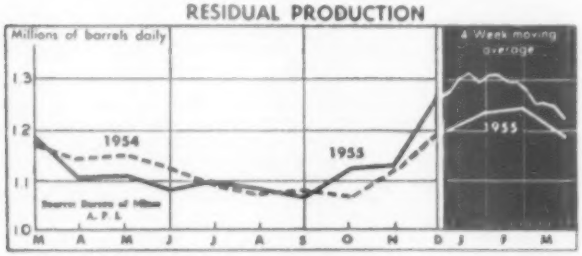
MIDDLE-DISTILLATE PRODUCTION



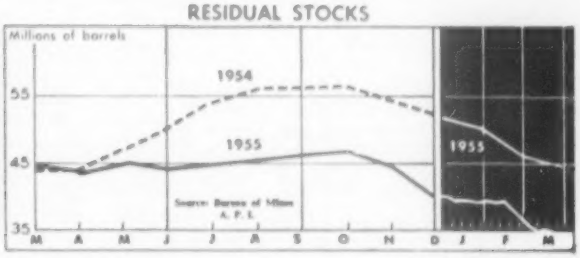
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, MARCH 30

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks†—Gaso.‡	Kero.	Dist.	Resid.	Bureau of Mines, March 1955—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,135	422.9	37.6	273.3	287.3	40,770	7,093	19,608	9,117	1,102	437.2	40.4	306.4	244.5
Appalachian:														
District 1	89	32.9	4.1	19.1	7.6	4,670	379	1,186	304	98	41.2	5.2	25.2	9.1
District 2	114	56.0	7.9	22.3	17.3	3,172	413	569	303	91	47.7	6.6	19.3	15.1
Ind., Ill., Ky.	1,366	696.2	74.1	283.6	185.0	41,879	3,212	9,937	3,513	1,394	707.5	80.1	312.6	190.2
Okla., Kans., Mo.	622	372.3	25.0	153.1	28.1	22,836	693	6,974	1,014	670	380.0	19.0	171.5	45.4
Inland Texas	264	178.4	9.4	53.3	24.3	7,435	329	1,251	1,329	258	182.6	11.4	52.6	18.2
Texas Gulf Coast	1,976	902.4	108.1	505.3	253.7	27,479	2,634	7,880	5,094	1,894	843.4	130.6	525.8	243.5
La. Gulf Coast	669	320.1	38.3	180.9	42.3	10,560	1,482	4,281	1,508	645	305.3	60.5	165.7	39.8
N. La. and Ark.	71	24.3	5.9	16.1	2.7	4,780	495	918	47	94	33.9	10.7	21.9	6.7
Rocky Mountain:														
New Mexico	22	11.6		3.9	2.7	286	8	77	32	20	11.4	0.5	3.0	2.7
Other Rocky Mtn.	240	123.4	4.4	60.0	41.7	8,483	252	2,233	911	256	119.9	4.6	62.9	40.0
California	1,126	494.4	4.9	148.1	359.4	25,859	343	7,669	10,724	1,027	456.9	4.4	180.2	383.5
Mar. 30, 1956	7,694	3,634.9	319.7	1,719.0	1,172.1	198,209	17,333	62,583	33,896	7,549	3,567.0	374.0	1,847.1	1,238.7
Mar. 23, 1956	7,970	3,684.0	361.9	1,760.1	1,232.6	196,801	17,710	65,912	34,047					
Apr. 1, 1955	7,206	3,395.9	330.4	1,682.0	1,130.7	185,282	18,620	61,850	44,634					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-oil and refinery prices at representative U. S. and foreign points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (86 octane)	11.25-11.50
Premium (94 octane)	12.75-13.00
Gulf Coast (Cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.25
Premium (97 octane)	13.00-13.25
New York (barges):	
Regular (89 octane)	12.25
Premium (96 octane)	14.50
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.15
Premium (93 octane)	14.0-14.25
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
★ Grade 26-70	4.5
Breckenridge:	
★ Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.25-10.375
Diesel oil (58 d.i. and above)	9.875-10.00
Distillate No. 1	9.875-10.00
Distillate No. 2	9.25-9.375
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.25-9.5
★ Distillate No. 2	8.75-9.25
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
★ Distillate No. 2	8.75

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.10

★ Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$2.05-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.10-2.20

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	24
200 vis. neutral (180 at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16.16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$2.91	2.45	
25-25.9	2.64	2.60	2.93	2.47	
26-26.9	2.69	2.62	2.95	2.49	
27-27.9	2.76	2.64	2.97	2.51	
28-28.9	2.83	2.66	2.99	2.53	
29-29.9	2.91	2.68	3.01	2.55	
30-30.9	2.97	2.70	3.03	2.57	
31-31.9	3.04	2.72	3.05	2.59	$2.46
32-32.9	3.12	2.74	3.07	2.61	2.48
33-33.9	3.20	2.76	3.09	2.63	2.50
34-34.9	3.27	2.78	3.11	2.65	2.52
35-35.9	3.34	2.80	3.13	2.67	2.54
36-36.9	3.39	2.82	3.15	2.69	2.56
37-37.9		2.84	3.17	2.71	2.58
38-38.9		2.86	3.19	2.73	2.60
39-39.9		2.88	3.21	2.75	2.62
40 and up		2.90	3.23	2.77	2.64

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas, and Wyoming (sweet). †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, March 16, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.20
Middle District	4.07
Southwest Pennsylvania	3.78
West Virginia	3.66
Buckeye Grade	3.60
Zanesville Grade	3.02
Illinois Basin	3.00
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-48.9°, Tucupido	*$3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES (PER LONG TON)

(Latest reported spot fixtures)

★Gulf-U.S.N.H., clean (USMC+5%)	$2.99
★NWI-U.S.N.H., dirty (USMC+7.5%)	2.90
★NWI-U.K., dirty (Scale+35%) (43s. 10d.)	6.16
★P.G.-Japan, dirty (USMC—20%)	7.20
★P.G.-France, dirty (USMC—10%)	9.81

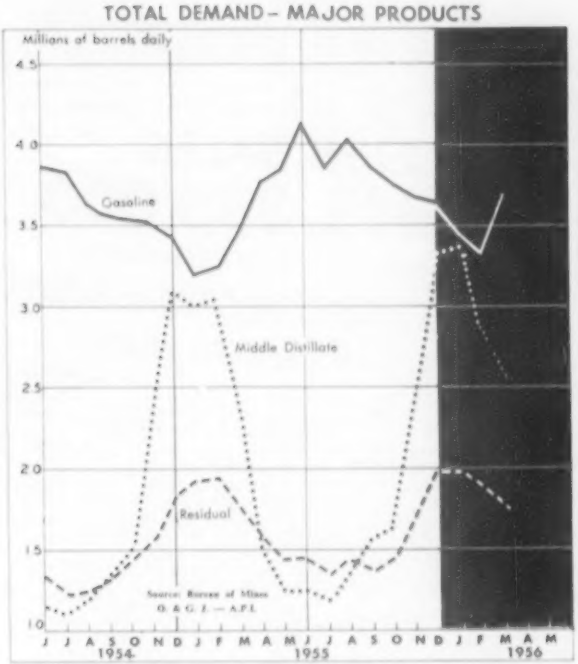
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

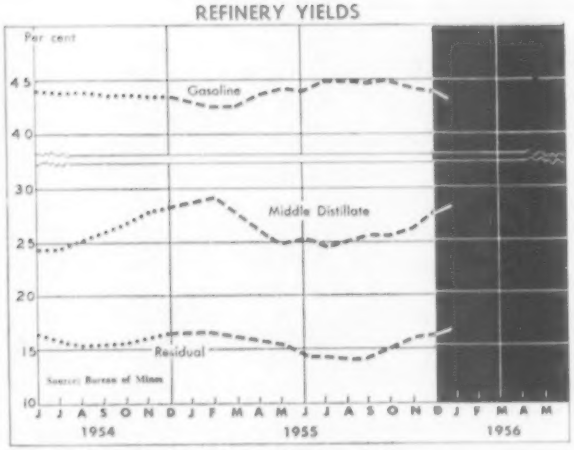
	Total demand	Refinery production	Stocks end of period†
Gasoline			
March 1956*	3,704	3,710	198,209
February 1956*	3,368	3,726	194,474
January 1956	3,335	3,843	183,905
April 1955	3,786	3,409	175,601
March 1955	3,487	3,460	183,972
Kerosine			
March 1956*	396	354	17,333
February 1956*	459	380	18,582
January 1956	569	385	21,310
April 1955	202	312	21,486
March 1955	361	357	18,187
Distillate			
March 1956*	2,170	1,817	62,583
February 1956*	2,437	1,939	72,414
January 1956	2,756	1,923	86,141
April 1955	1,287	1,534	70,139
March 1955	1,936	1,703	62,457
Residual			
March 1956*	1,732	1,224	33,896
February 1956*	1,869	1,285	36,293
January 1956	1,980	1,344	38,247
April 1955	1,553	1,110	43,838
March 1955	1,750	1,185	44,970

*Preliminary. †Thousands of barrels.

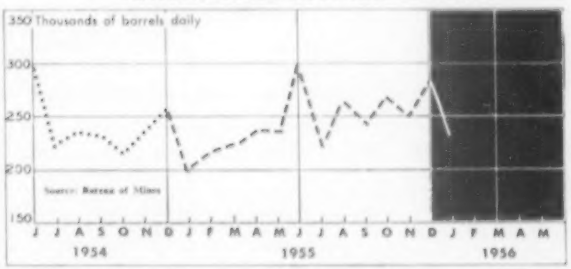
TOTAL DEMAND – MAJOR PRODUCTS



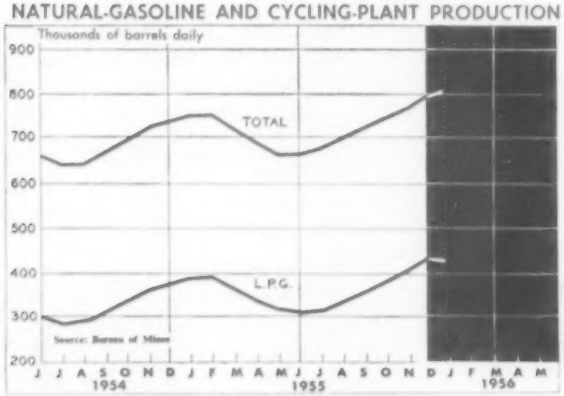
REFINERY YIELDS



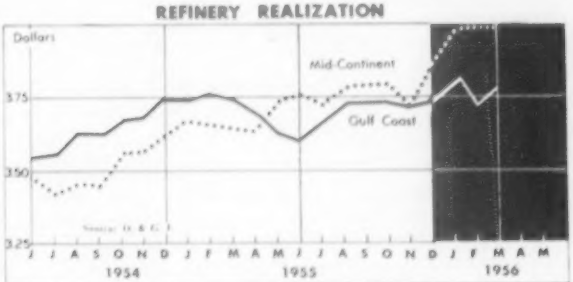
TOTAL DEMAND–AVIATION GASOLINE



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION

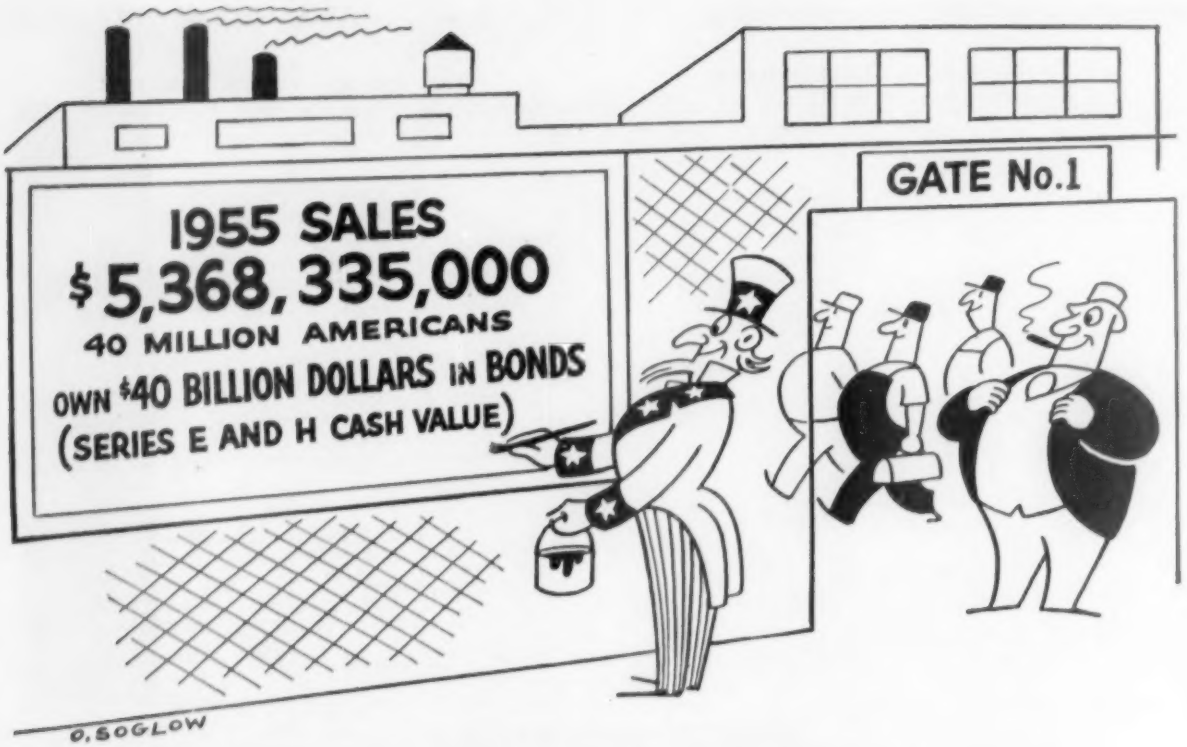


REFINERY REALIZATION

	Mar.* 1956	Feb.* 1956	Jan. 1956	Mar. 1955
Mid-Continent	$3.95	$3.95	$3.92	$3.64
Gulf Coast	3.78	3.75	3.77	3.74

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel oil, and residual as published in The Oil and Gas Journal.



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BOX J-300,
THE OIL AND GAS JOURNAL,
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WANTED, Party Chiefs, Seismologists, Computers, Surveyors, and Observers for domestic work in Louisiana, Texas, Oklahoma and New Mexico, and possibly some foreign work.

REQUIREMENTS: Interpretive positions must have a minimum of two (2) years college plus experience. Field positions must have minimum two (2) years experience. Observers with SIE, Electro-Tech and Century experience preferred. Mail letter of inquiry with pertinent information and references to:

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P. O. Box 12217 — **Fort Worth, Texas**

Route 4, Box 646 — **Houston, Texas**

HELP WANTED

EXPERIENCED Petroleum Engineers to fill vacancies created by expansion wanted by medium sized oil company operating in all areas east of California. Applicants should have minimum of 3 years field experience. Replies confidential. Please furnish detailed summary of academic and experience background. Box J-377, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLERS are needed in connection with the International Geophysical Year program in Antarctica. The Failing 314C drill is under modification for this ice work and will be operated in Greenland this summer before shipment to Antarctica. Drillers are needed for both the Greenland and Antarctic operations. The tour of duty in Greenland will run from June to September 1956, while Antarctic tours will be November 1956 to March 1957, November 1957 to March 1958 and November 1958 to March 1959. Salary scale for the Antarctic operation will be $6000 to $8000 per year, plus expenses. Interested personnel should write to A. P. Crary, USNC-IGY Office, 1145 19th St., N. W. Washington, D. C.

SITUATIONS WANTED

REFINERY ENGINEER, M.S. Degree. Fourteen years diversified experience in Refining and Natural Gasoline field. Desire responsible position in operations, project engineering or sales. Box J-462, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM Engineer desires position with independent oil company. Eight years experience with major company; principally in field operations. Last four years as production supervisor of large area. Box J-474, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 33, 6½ years diversified Oklahoma subsurface experience with major company, including 3½ years Southern Oklahoma, desires position with independent or small company. Currently employed. Complete resume on request. Box J-467, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with 18 years of drilling, oil, distillate and gas well experience. Field and administrative. Handled district organization and petroleum engineering department for major. Desire change to manage independent's operations. Excellent references. Reply Box J-468, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION EXECUTIVE, 46. 21 years diversified geophysical and geologic experience, seismic, gravity, stratagraphic organizations, U. S., Canada, Middle East. Wide range contacts. Active member AAPG, SEG, API. Desire executive position independent oil company or contractor. Free to travel. Box J-475, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER now in supervisory position as Area Engineer over large, active major company area wants job having equal or greater responsibility with independent. 29, married, graduate, 6 years West and West Central Texas experience. Outstanding promotion record based on ability all phases production and drilling. Box J-458, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN available immediately. Now in Denver. 8 years experience in Permian and Denver Basins. Will relocate. Box J-466, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTORNEY, age 28, licensed in Illinois, desires administrative or legal department position with corporation. Two years trial experience. Excellent educational background including two years at U. S. Naval Academy. Box J-472, The Oil and Gas Journal, Tulsa, Oklahoma.

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TOP LEVEL graduate engineer seeks a position with a sound aggressive independent requiring a man with solid administrative and practical background and knowhow in drilling, producing and cost engineering; both domestic and foreign. Well experienced in program planning and budget analysis. Excellent character and business references covering years of diversified experience. Age 38. Reply

Box J-469, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANTED

TO PURCHASE oil production or corporations having production for cash or stock in a listed company (or combination of both). All replies strictly confidential. Box J-412, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box J-470, The Oil and Gas Journal, Tulsa, Oklahoma.

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CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Production.

WILL GIVE one-half interest in fully equipped shallow lease, for well, acid frac completed. H. A. Miller, Glasgow, Ky.

CUBAN OIL PROPERTIES at two producing fields offered. References and immediate drilling required. Drilling Co. Box 2089, Havana, Cuba.

10,000 ACRES under good lease. S. W. Iowa, Forest City Basin, good geology, will assign to drilling firm for exploration. Before July 1, 1956. R. A. Trygg, Ogden, Iowa.

160 ACRE Utah Oil Lease, Bargain, on structure, near gas wells. Owner: R. Barnsley, 950 Lincoln Ave. Palo Alto, Calif.

FOR SALE: Producing oil and gas wells and leases located in Garvin, Stephens, Kiowa Counties, Oklahoma. For details call or write, Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

FOR SALE—In Quay, San Miguel and Lincoln Counties, New Mexico. 3400 acres State issued oil and gas leases running full 10-year term. Rentals 10c per acre. Price $2.00 per acre all or part. Engineer's report available. James S. Richards, 1346 Connecticut Avenue, N. W. Washington 6, D. C.

OIL, GAS & URANIUM lease, 78,400 acres New Mexico. Solid tract, one owner. $1.00 per acre bonus, 50c per acre annual rentals 10 year commercial lease. Box J-418, The Oil and Gas Journal, Tulsa, Oklahoma.

VENTURE CAPITAL WANTED!

Financing needed for oil drilling deals in Southern Coastal Region. Need contact with drilling syndicates or investors in favorable tax brackets to finance several drilling propositions on **good geological prospects. Ethical operation.** References furnished.

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BUSINESS OPPORTUNITIES

HAVE EXCELLENT financial, business associations with various major companies New York area. Participations, complete deals. Principals only. Box J-476, The Oil and Gas Journal, Tulsa, Oklahoma.

First City National Bank Of Houston Is Formed

Consolidation of the First National and City National Banks was approved by their stockholders recently. The resulting First City National Bank will be the largest in Houston, third largest in Texas and the South, and among the top 50 of the nation. Announcement of the effective date of consolidation will await formal approval by the United States comptroller of the currency in Washington.

The First City National will have combined capital and surplus of $41,000,000, undivided profits of approximately $4,000,000, and authority to make loans up to $4,100,000. Deposits of the consolidated bank will be in excess of $600,000,000 and assets approximately $700,000,000.

Under terms of the consolidation, the present City National Bank Building, which would be renamed the First City National Bank Building, will house the new financial institution.

Recommended by the two boards for key executives positions are: James A. Elkins, Sr., City National board chairman, senior chairman of the new bank; W. A. Kirkland, First National president, chairman of the board; P. P. Butler, First National board chairman, one of the three First City National vice chairmen of the board; and James A. Elkins, Jr., president of City National, president of the new bank. It was also recommended that all other officers of the two banks retain their relative positions.

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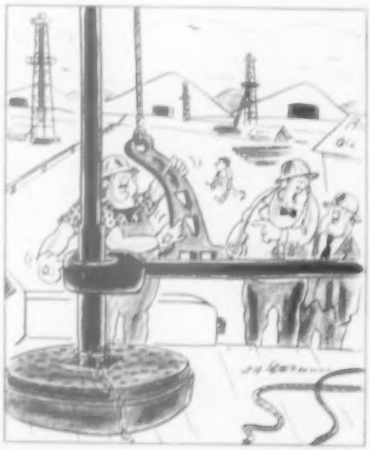

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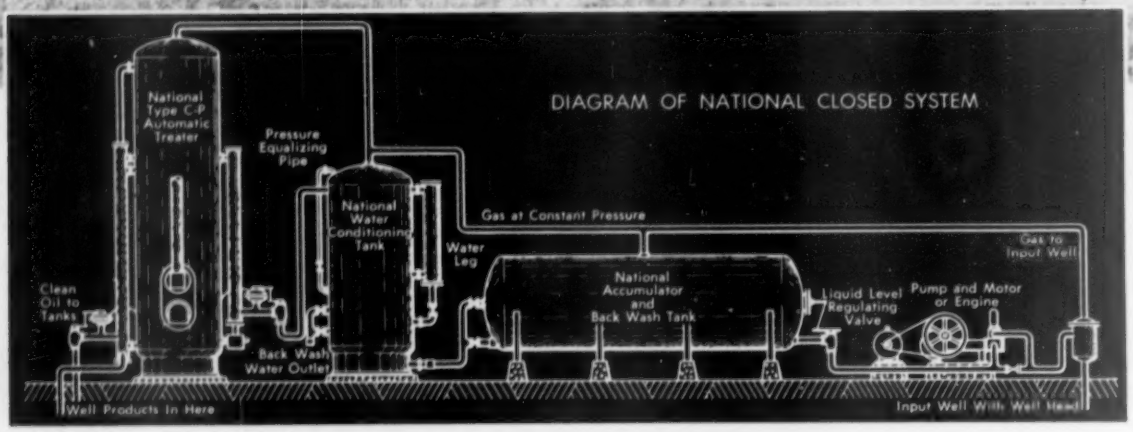
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